NJSGC and Union County College

Building a partnership for increased student opportunities in STEM

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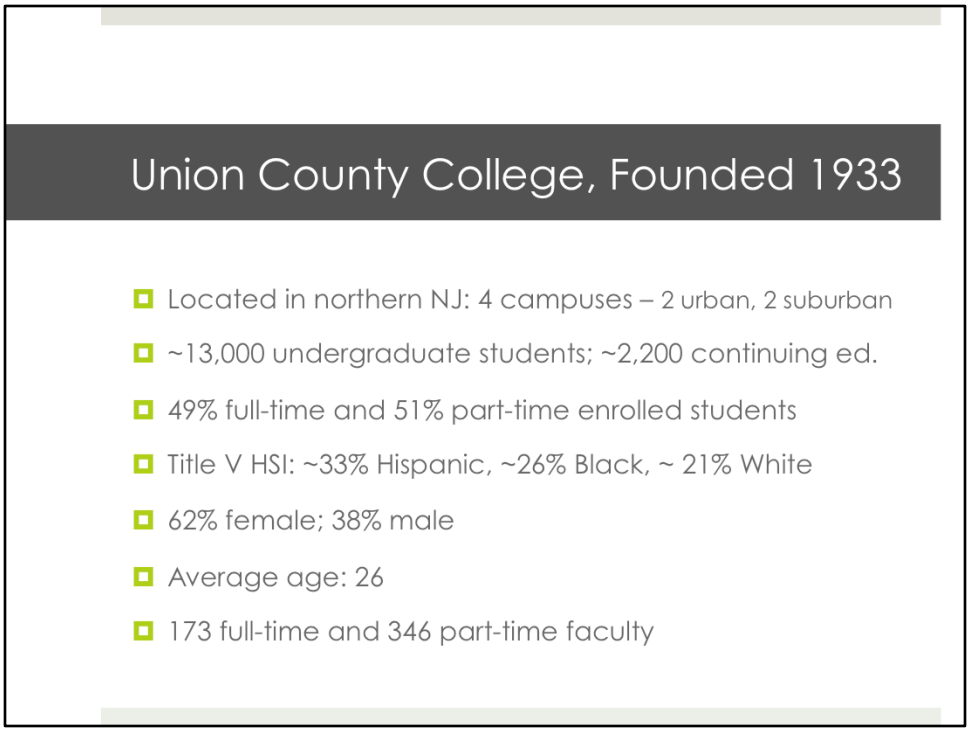
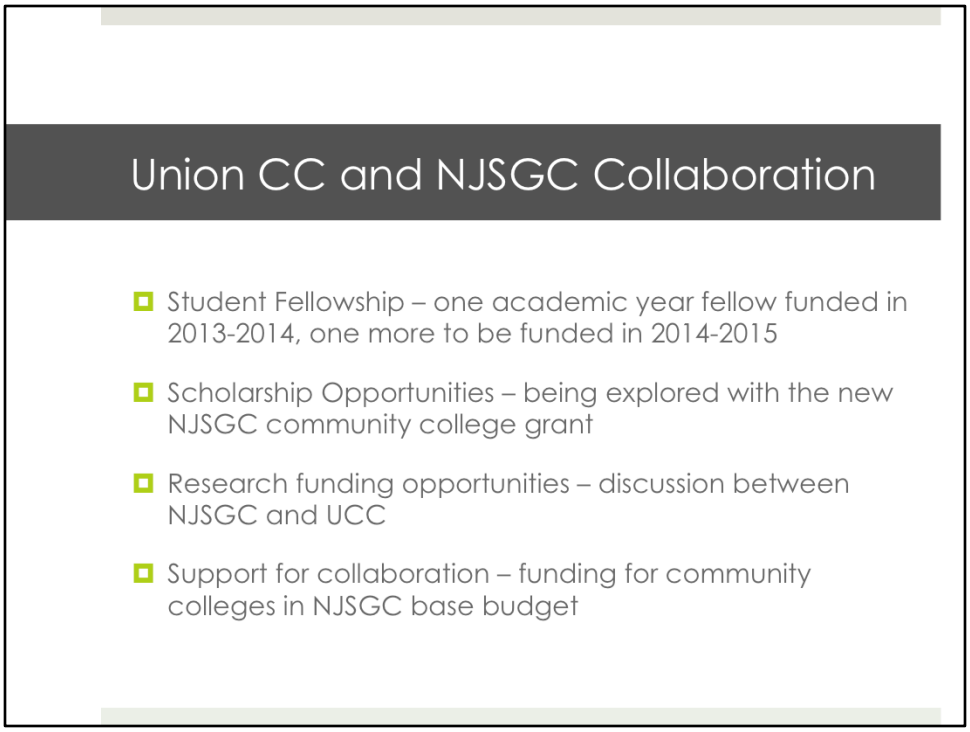
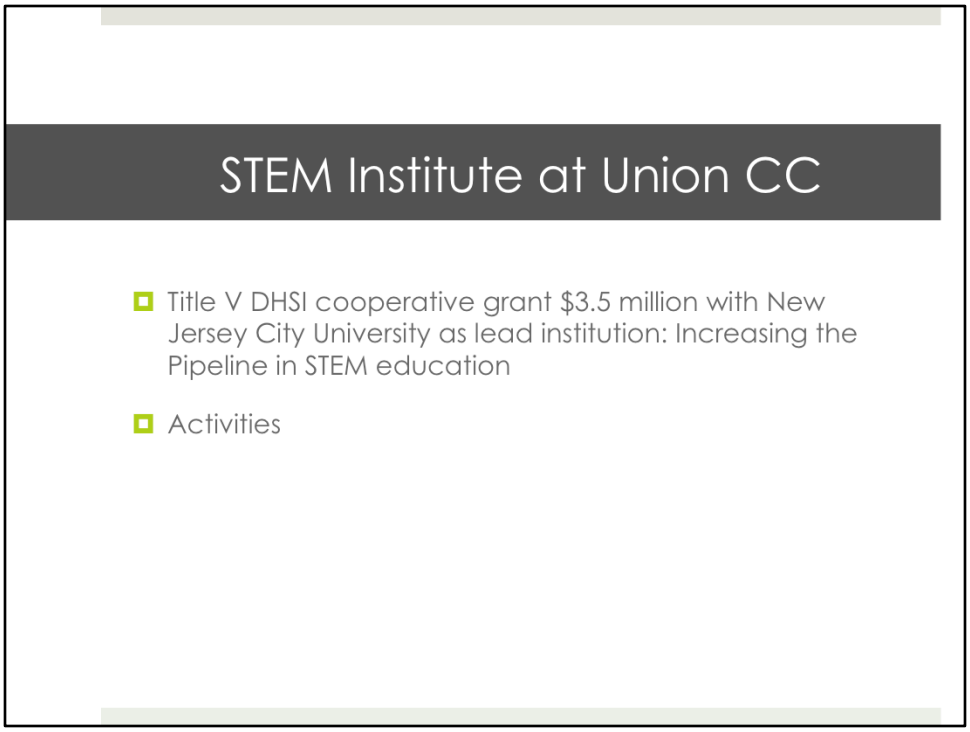


Union, the oldest community college in New Jersey, is a public comprehensive college committed to serving the educational needs of Union county and its surrounding areas. With campuses in Cranford, Elizabeth, Plainfield and Scotch Plains and students from 83 countries, Union represents and reflects one of the most socio-economically, racially and ethnically diverse populations in the state. The College offers over 70 degree and certificate programs in the arts, sciences and applied sciences, as well as continuing education, career programs, college preparatory programs and intensive English language studies.

The data here, reflect the 2013-2014 AY. We have roughly 13,000 undergraduate students enrolled: 49% full time and 51% part-time, and approximately 2,200 students who are enrolled in our continuing education programs. We are a federally designated Title V institution, and that is Hispanic Serving Institution. Approximately 33% of enrolled students are Hispanic, 26% African-American, roughly 21% white, 10% Unknown, and approximately 14% other self-reporting minority groups. 62% of our population is female. The average age is 26. We have 173 full-time faculty and 346 part-time faculty.



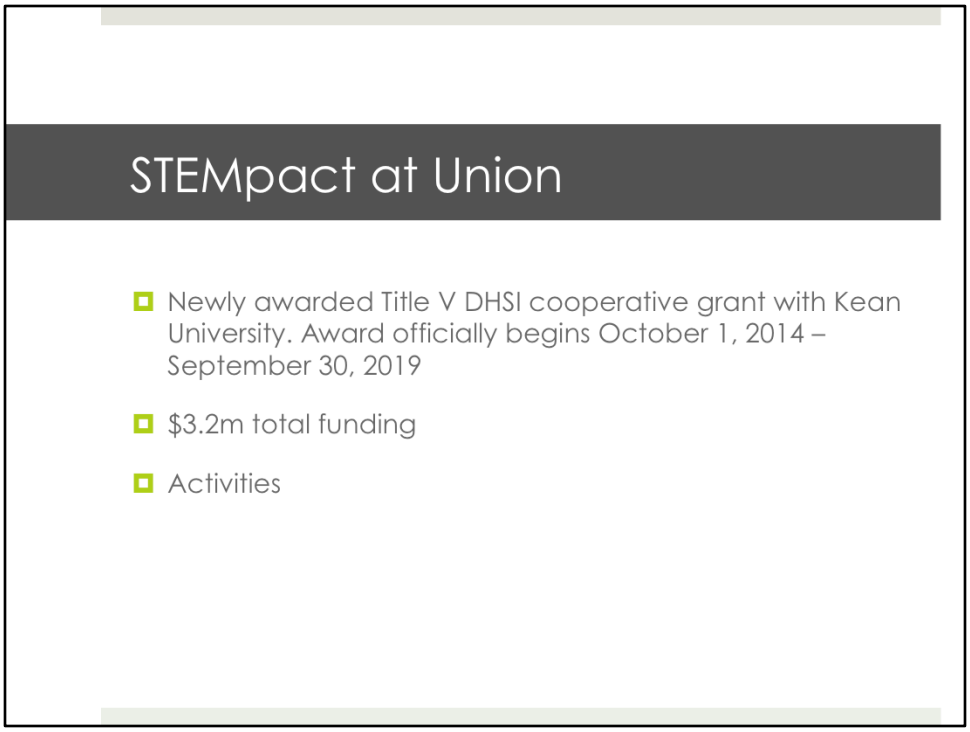
Last fall, Union County College met with Dr. Haim Baruh and learned about NJSGC: its history, its mission, and its funding priorities. At that time, Dr. Baruh also told us that he believed that community colleges would be part of the next round of grant opportunities with NASA. Dr. Baruh asked if Union would be interested in joining the consortium. After learning about the expectations, and understanding more fully the opportunities, Union agreed. The NJSGC discussed the expectations of an affiliate, was offered Union one academic fellowship, and a partnership was formed. During this time, as Union's representative, I have distributed information to our students, and faculty in regard to opportunities from NASA (scholarships, research grants, etc.) as well as participated in NJSGC meeting, and collaborated on the recent grant that was awarded.



As the Program Assistant at the STEM Institute, I was looking to enrich opportunities for our students, and working with the NJSGC has proved to do just that. The STEM Institute is a fully-funded Federal Title V DHSI cooperative grant, and as such has supported STEM and STEM teacher education students through a number of high impact student activities from 2009-2014.

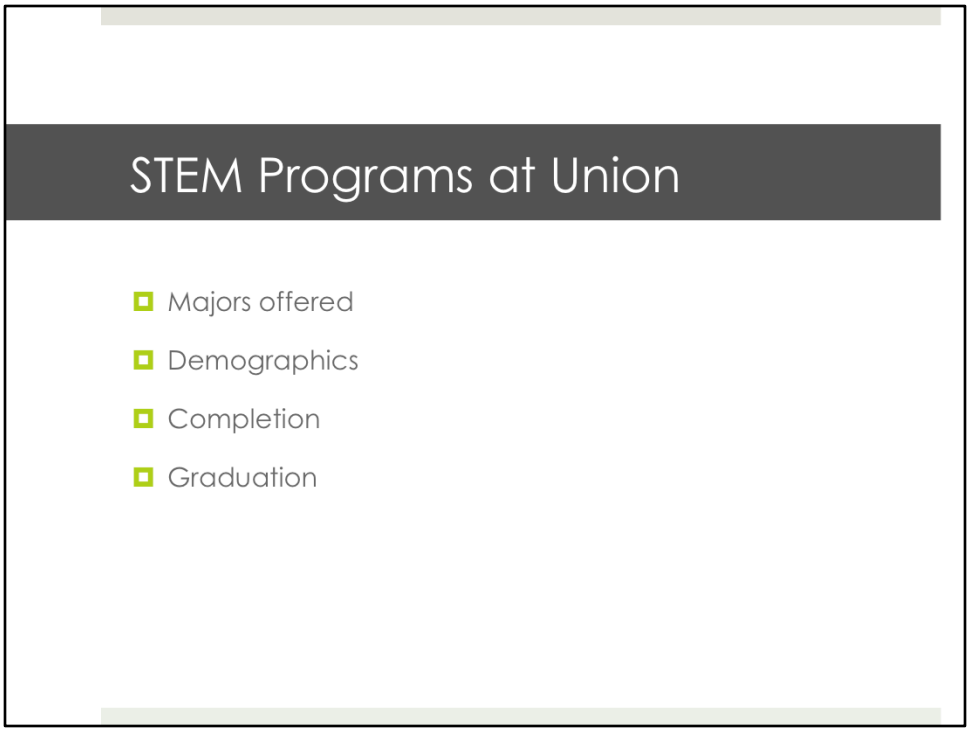
The STEM Institute activities have been divided among student academic support: SI, STEM lounges, a variety of seminars that focused on STEM transfer sessions, career opportunities in STEM, STEM field trips, college tours, and intrusive advising. In addition to the student support, faculty have also been given resources, including: Faculty professional development: bi-annual PD conferences, and intermittent workshops that were held throughout the year, in addition to purchasing equipment, software, and national conferences, etc.

The grant has encountered many challenges and successes, but I will table that until later in my discussion when I focus on challenges and successes of our STEM students.

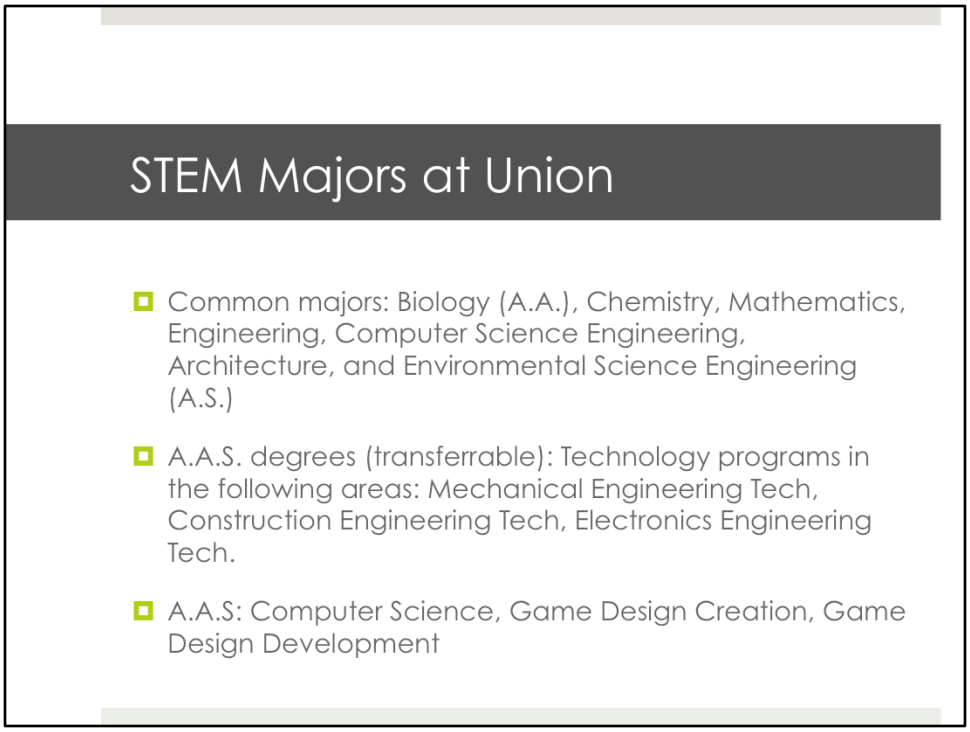


Fortunately, Union was recently awarded a new Title V DHSI cooperative grant. We were the only NJ institution to be awarded. The new grant is similar to the current grant, in that there will be academic support on a variety of different levels, and support of faculty professional development. However, this New STEMpact grant is a cooperative grant with Kean University, which is in closer proximity to Union. One of the grant's main focuses will be a MakerSpace, and the implementation of innovative pedagogy including the Flipped Classroom and the development of micro-lectures.

Additional activities will include academic support, utilizing the nationally recognized Peer-Led Tutoring Model, out of the City University of New York, and more hands-on inquiry based learning for pre-service teachers to more effectively engage in the STEM subjects in early childhood education.



The next few slides will focus specifically on the STEM program at Union County College, including the majors we offer, demographics of our students, completion, and graduation rates.



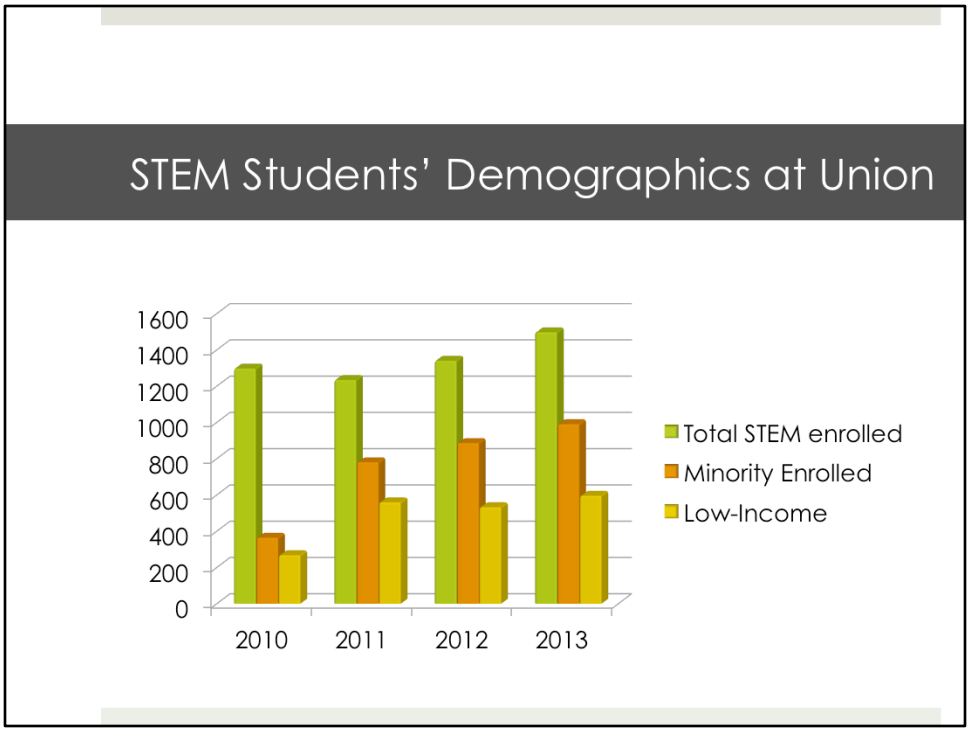
This slide shows some of our most common STEM majors offered within the A.A. and A.S degree areas: BIO, CHE, Engineering and Math.

We also have a number of A.A.S. degrees. What we have found is that there is a national trend to increase AAS degrees, and our largest feeder school of Engineering majors: New Jersey Institute of Technology (NJIT), accepts our AAS technology degrees as fully transferrable. This is not usually the case.

As a community college, we are particularly mindful of the Lampitt Bill to ensure that our programs will transfer seamlessly.

The other AAS degree programs that we offer are traditional "terminal degrees" and include: the Comp Sci, Game Design Creation and Game Design Development.

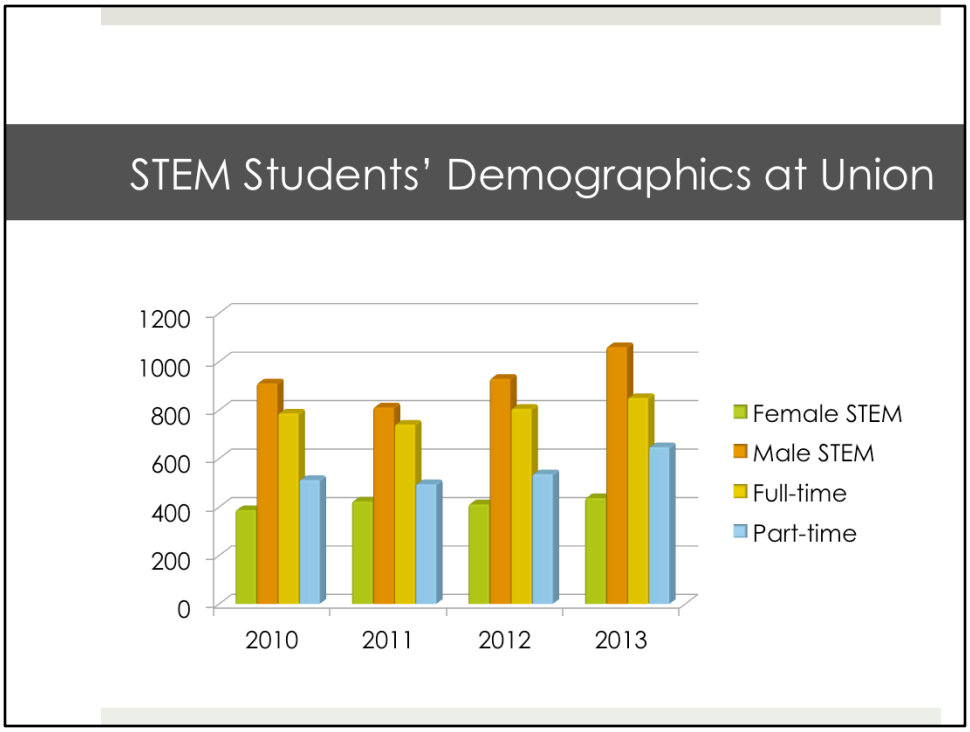
We also have a new certificate in Photovoltaic studies



The next two slides focus on the demographics of STEM students.

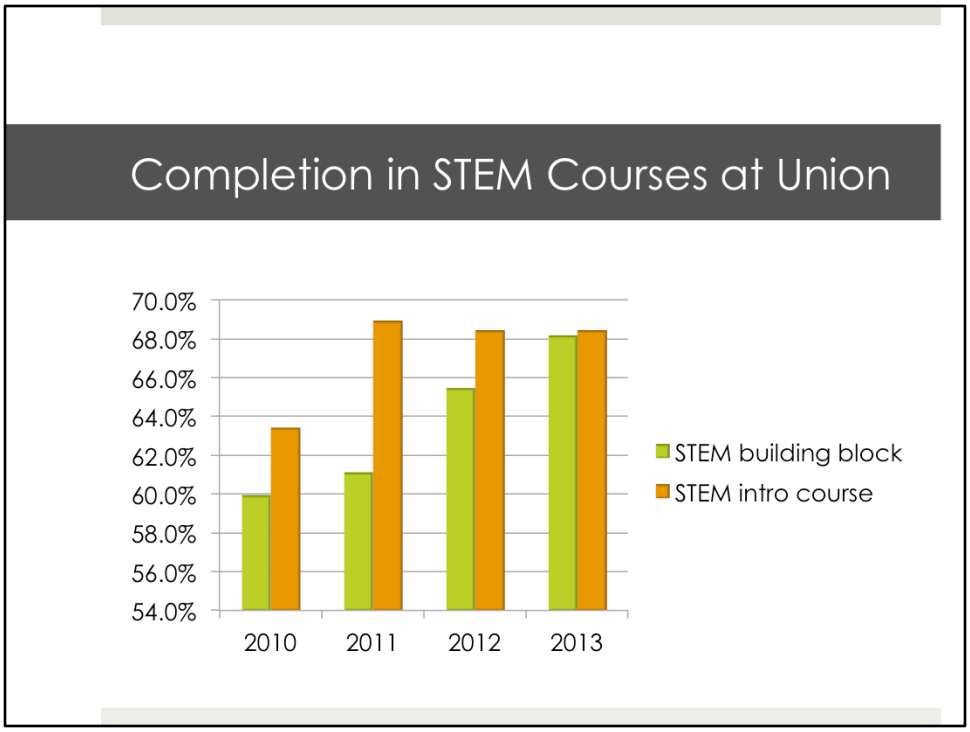
Total enrollment numbers- students who are STEM majors – In 2010: 1297 STEM students, 2011: 1234; 2012: 1340 and 2013: 1497. This translates to roughly 10% of our overall population.

The 2011 reporting guidelines for ethnicity changed, as such the 2011-2013 AY seem to reflect a better picture of the demographic. As you can see from looking at the data from 2011-2013, more than 60% of our students are minority and 40-48% are low-income, which means these students are entitled to Federal student aid



This chart reflects total enrollment numbers of students who are STEM majors –

25-35% of our STEM students are female, and 65-75% are male. This is on par with national numbers, but if you look at Union's overall population – the numbers are flipped with 65% females enrolled compared to approximately 35% male students enrolled. I don't show the age here, but the average age of our STEM students is 23, which is lower than the mean age of total enrollment at Union (26). STEM students who are enrolled full-time hovers between 55-60%, which surpasses Union's nearly 50% of full-time student overall.

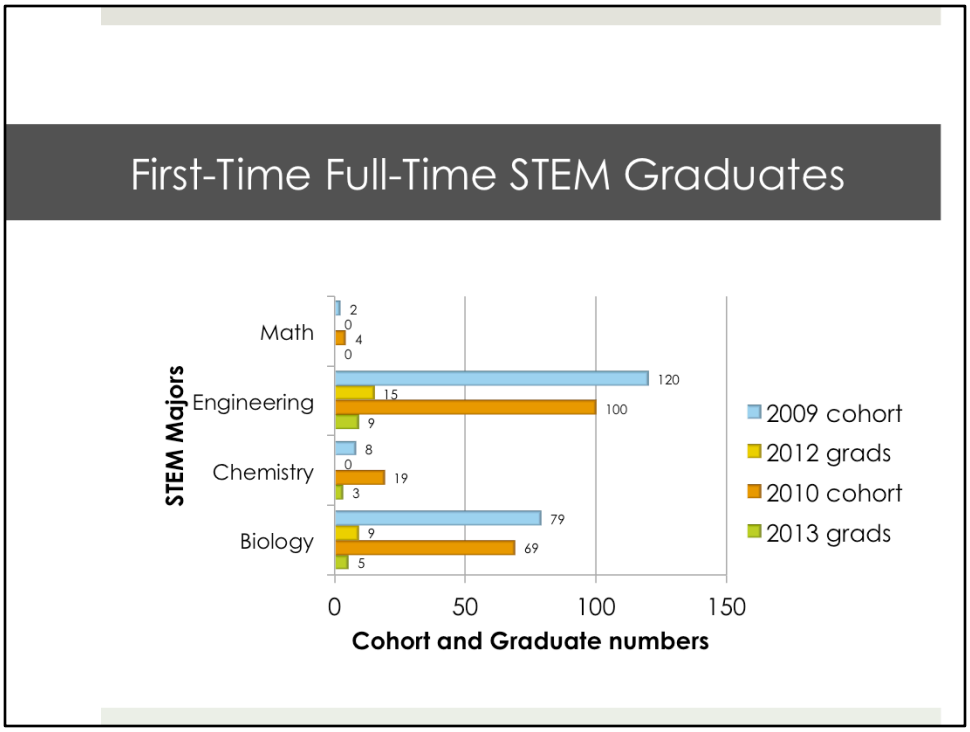


These percentages show course completion rates in STEM building blocks and STEM intro courses.

Building blocks are generally identified as pre-requisites necessary within a particular major. Here they are: intro to Comp Sci, Pre-calc 1 and Pre-Calc 2, Intro to Engineering. Again, most of these courses are pre-reqs for the major.

The Intro courses are generally identified as those first level courses within a specific major. Here they are: Calc I and II, BIO I, CHE I and II, PHY I, EGG I CSC II, which are all courses within the actual major.

As you can see, our course completion rates in STEM core courses are approximately 70%. Conversely, more than 30% are NOT completing these fundamental courses, meaning students are either dropping out or having to retake courses 1, 2, and even 3 times before moving on within their major.



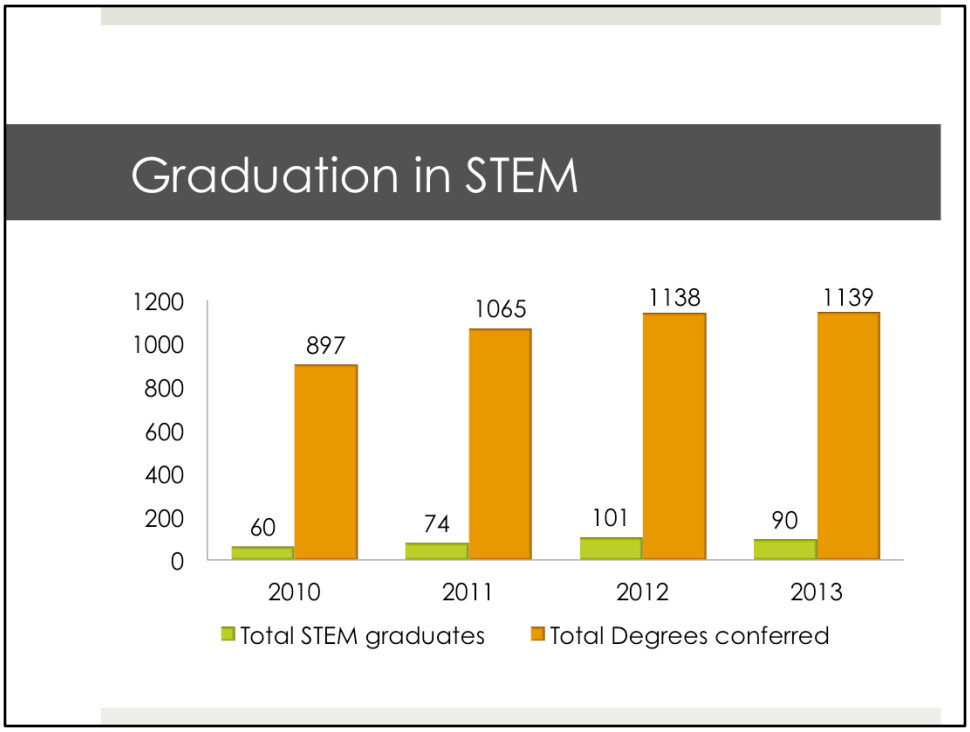
This chart represents First-time full-time students who declared their major in one of the STEM areas and ultimately graduated within the 3-year graduation rate.

Before we look more closely at these numbers: a few things to point out – the ENGR numbers include all 4 majors: ENGR, ENCS, ENAR and ENES. Also, keep in mind, that the data here represents a snapshot in time. The STEM students who are represented in the cohort could have changed their major, and that is not data we have available to compare.

We can see that in Mathematics, there were 2 students in the 2009 cohort. No students graduated within 3 years. In the 2010 cohort, we had 4 Math majors, with 0 graduates in 2013.

- Engineering: 2009 cohort – 120 students with 15 graduates in 2012. 2010 cohort 100 students, with 9 graduates.
- Chemistry: 8 students in 2009 cohort with 0 graduates in 2012; 19 students in 2010 cohort with 3 graduates in 2013.
- Biology: 79 students n 2009 cohort with 9 graduates; 69 students in 2010 with 5 graduates in 2013

Total 2009 cohort - 2,073; 179 graduates total = 8.6% grad rate
Total 2010 cohort: 2181; 148 graduates total 6.8% grad rate

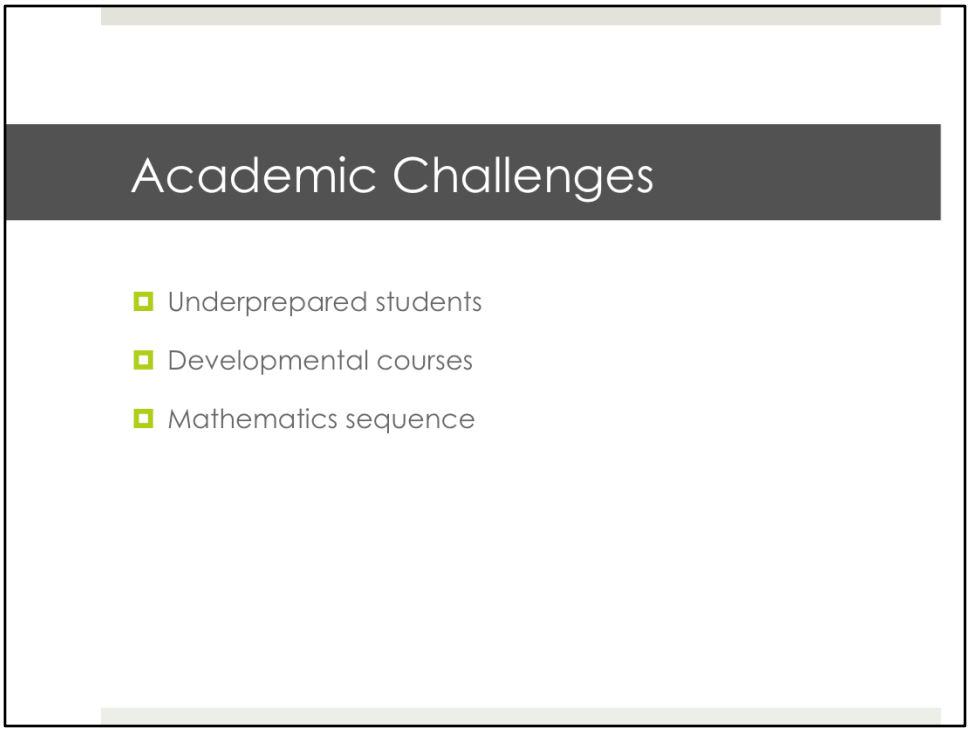


Raw numbers of total STEM and Union graduates

2009 - 2,073 179 graduates total = 8.6% grad rate
2010 cohort: 2181 148 graduates total 6.8% grad rate

Success with STEM Students

- Our STEM students report being prepared when transferring to 4-year institutions
- STEM students are presenting at poster presentations and participating in undergraduate research
- STEM students are gaining entry into competitive and selective programs
- STEM students have built a sense of community at Union
- Most of our student leaders are also STEM students



As you can see, we have our challenges. Our students do not know how to study for STEM subjects. Often their high schools were not rigorous enough, so students are overwhelmed when they take Calc I or Organic Chem or Physics II.

Since we are an associate's degree institution, Union does not have the peer leaders to work in the tutoring center in advanced courses. Once our students complete the highest level of academic studies here, they move on to the 4 year institution. This can present a challenge when our current students need peer tutoring support in higher level maths and science, like the Physics II or Differential Equations, etc.

Approximately 50% of students who attend Union must take at least one developmental course: English or Math

Union uses the Accuplacer for math and English placement. All of our students must take this test, unless they took the SAT, and were able to waive this requirement. Most of our STEM students place into 2 different maths: 022 or MAT 119. MAT 022 is the last sequence of developmental math and MAT 119 is College Algebra. As you can probably guess, the first math in the STEM majors is Calc I. If students test into MAT 119, they have 3 math courses to take before they can start the first semester sequence. This can present enormous financial difficulties for students as well as add up to 3 semesters to their associate's degree.

Similar to the academic challenges discussed, our students' personal challenges can be difficult to overcome. Roughly 50% of our students are the first in the family to attend college, and our students have difficulty navigating the unfamiliar landscape of college. Students do not understand the financial aid process, they do not know how long to study or how to study, they do not know how to create study groups, how to conduct research that is appropriate for college level academic pursuits. Our students' families do not understand how much time the student must put in to succeed. As a commuter school, students really have to make an effort to create a community of like-minded students to succeed. Almost 85% of our students are juggling something other than going to school. Many are working full-time – 40+ hours a week. Many are married, and have families. Many have to contribute to the household income. Some are single with children. These are only some of the difficulties that our students face.

As a mid-size community college, we do not have the equipment and technical software that students need to compete with their 4-year counterpart when it comes to research. While nearly 75% of our faculty hold terminal degrees in their field of study, many came to the community college because they were not interested in research; therefore, our student do not have the number of faculty to support them in undergraduate research or even to encourage that pursuit of study. So, when our student go on to the 4-year institution and eventually to graduate school, they are presented with additional challenges since they often do not have the same level of academic experience for graduate work.

While our institution is very supportive of STEM initiatives and its success, funding for supplemental STEM support is not readily available. The budget is tight.

- More undergrad research opportunities and internships to be able to compete with their 4-year counterparts
- They need bridge programs at 4 year institutions to help with the transfer experience
- They need to see more STEM professionals who look like them, and they need STEM mentors to help them see the possibilities of STEM careers
- They need specialized transfer programs to ensure they do not fall victim to "transfer shock"

Union's Contribution to Community Colleges Grant with NJSGC

- Teleconference
- Editing proposal
- Assessing Union's needs
- Aligning Union's needs with Grant purpose

Grant Awarded!

- Continued collaboration with four-year institutions
- Increased opportunities for community college students
- Academic fellowships

As you can see the community college landscape is very different than the 4-year institution, and it has its challenges. With increased opportunities for our students, they will be better prepared when they arrive to the 4 year institution, and be be better prepared upon graduation. STEM is growing across community colleges, and I think we need to partner with 4-year institutions to ensure that our students stay competitive, and have all the academic resources they need. Union is very lucky to have this partnership with the NJSGC, and I know our students will benefit from more of these type of opportunities.