The SRI Homeroom – Episode 15

Supporting and Empowering STEM Students in Community College

Jenna Nguyen:

Welcome to the SRI Homeroom. Today, a national effort to support underrepresented students in community college.

Andrea Beesley:

To meaningfully, on a larger scale, increase participation in STEM, there have to be multiple pathways that are not what we would think of as traditional, that work just as well, and I think arguably make our STEM industries stronger.

Jenna Nguyen:

Bridging the gap between STEM classrooms and STEM careers, today, on the SRI homeroom. Welcome in.

Hello, and welcome to the SRI Homeroom. I'm your host, Jenna Nguyen, and today, I'm so excited to be talking with two brilliant and passionate education researchers, Andrea Beesley and Carol Tate, about all things science, technology, engineering, and mathematics, otherwise known by the acronym STEM. Hi, Andrea.

Andrea Beesley:

Hi, Jenna. I'm Andrea Beesley at SRI, and here, I direct the STEM and computer science team and the education division. And I enjoy studying mathematics, especially learning environments that are welcoming and encouraging.

Jenna Nguyen:

Great. Thanks, Andrea. And hi, Carol. Over to you.

Carol Tate:

Hi. I'm Carol Tate. I'm a senior education researcher at SRI, and I specialize in design and research and evaluation projects with a focus on improving teaching quality in STEM fields, and these span from elementary school through college. Very happy to be here.

Jenna Nguyen:

We're very happy to have you both. So it seems like we've been telling students to major in STEM fields forever because there's been a high demand in the job market for STEM workers, and the jobs are rewarding. So we've seen some big changes.

The number of STEM graduates has more than doubled over the last 20 years or so, but there's still a need there, right? Can you talk about this need, and maybe perhaps the dynamic of this supply-and-demand, and what this all means right now?

Carol Tate:

Yes. It's true that the number of graduates in STEM programs has roughly doubled since 2001, but if you think about the world in 2001 versus now, it's a very different place, and the demand for STEM workers has increased massively during that period as our economy has become more driven by technology. So even with that increase, we're still not projected to be producing enough STEM workers.

Andrea Beesley:

And at the same time, we also would love for the body of STEM workers and the economy also to look like the population that we have, so that means a more diverse group of STEM students, STEM graduates, and STEM workers. So we would like to retain more students from first-generation families, from low-income households, and from groups who are underrepresented in STEM.

Carol Tate:

Yeah. And while we are making progress and we do see increased diversity in STEM, but we still don't see that representation commensurate with representation in the population.

And if you look really closely, you see STEM workers from underrepresented groups are more concentrated in the STEM occupations that require less education certificate, more skills-oriented positions, rather than those requiring a four-year degree.

Andrea Beesley:

There are also a lot of potential STEM students who either drop out of a STEM pathway or even avoid entering one because they don't feel like they're going to belong, or they feel that the people who do the kind of work that they're looking at, they don't look like them, or they don't feel that they're going to have a home in certain careers, or feel like they belong in certain careers.

Or there's something in their educational pathway, often mathematics, that causes some trouble, and they don't persist into STEM in higher education or in career because of some bumps along the way.

Jenna Nguyen:

I'm glad you brought that up, Andrea, about the diversity, the desire for diversity in the field, and then Carol mentioning that there is still this level of under-representation that we're seeing.

So I would assume this would take a lot of intentionality. It's not going to be an easy task, and there's no magic policy or special tool that colleges can use to just make things better and to get to those outcomes that you're talking about.

But you've both been working on a project that has been trying something really unique. Can you tell us a little bit more about that project, what it is, what it's hoping to do?

Carol Tate:

Sure. We've been working on a project as evaluators for about six years now. The project is called the STEM Core Expansion Alliance, and it's a network of community colleges, or of STEM programs within community colleges, I should say. It's funded by the National Science Foundation program called the

Eddie Bernice Johnson Inclusion Across the Nation of Communities of Learners, of Underrepresented Discoverers in Engineering and Sciences, or INCLUDES. That's the name of the funding initiative.

And the STEM Core is a network of over 30 community colleges that use evidence-based practices such as academic acceleration, particularly in mathematics, cohort-based learning communities, contextualized learning, and very intensive student supports, as well as work-based learning opportunities or internships integrated within the STEM programs. So this is designed to really support low-income, first-generation, and underrepresented students to enter STEM careers.

Andrea Beesley:

So we've been working on the external evaluation of this STEM Core Expansion Alliance since 2018, and one of the interesting opportunities about this evaluation is that a lot of other studies of programs like this have happened at a single campus, or they have studied one particular component of the model. But in this evaluation, we've been able to study multiple campuses and multiple components.

And so we're really trying to learn something about the kinds of supports and barriers in a program like this, and how different campuses in different contexts experience those. So this is something that we really hope to bring to other community colleges who are looking at programs like this.

Jenna Nguyen:

So Carol, you mentioned this cohort model earlier. Can you expand on that and tell us a little bit more about what that looks like?

Carol Tate:

Sure. So a cohorted learning community is meant to kind of create a community for students, both academic and social, a sense of affiliation with a particular program so that they're not really going through this program all on their own. That they have buddies that are doing the same thing.

And this can be a range of things. It could be anything from just sort of belonging to the group, getting a T-shirt, going to some events that are particular for those group members, all the way up to taking all of your classes with your cohort all the way through your program, right? So we saw a cohort being interpreted in various ways, and we saw the meaning changing over time depending on what was happening at the school.

One of the big problems or challenges during the pandemic was enrollment, so sometimes it was hard to really create a whole big robust cohort and keep all those students together. Or if you have students coming in at very different levels in mathematics, for example, it's hard to make them take all the same classes to create a cohort.

So we saw a lot of different adaptations of the sort of cohort idea. We saw places where it was working really well, and you really got a sense that this cohort was able to really overcome some of the difficulties of being a community college student and confer some of the advantages that students in four-year colleges get, where they're all living together, working together, doing their homework together, and hanging out together, supporting each other through a difficult program. That can be a result of a cohort experience.

For students at community college who often have other responsibilities, they have work, they may have children, they may have to travel a long distance to campus, rather than just going, showing up, doing their thing by themselves and then going home, the cohort kind of gave them a little home away from home at the campus, or a campus family, if you will.

Jenna Nguyen:

Yeah. And I'm sure that during the pandemic especially, that lack of community or feeling isolated from your peers, that was something that was a real life need. So is that something that you were then able to take away from these past, I think you've been doing this for around six years?

Carol Tate:

Yeah. I would say that really one of my biggest takeaways from the evaluation work is what I think has been a takeaway for all of us through the pandemic time is just the importance of community and how much people need community. And we really saw how intentionally building a community of support for students can really help students who might otherwise not be successful make it through their programs.

Andrea Beesley:

Another really important component of STEM Core was the student support specialist, and it was the student support specialist role that really formed and supported the community, the cohort that Carol was talking about.

That role is someone who was providing advising. They sometimes call it intrusive advising. They don't necessarily just wait for the students to come to them, but they reach out frequently and keep in frequent contact with the students. They help the students connect with campus services, access tutoring, find out about scholarships, apply for internships.

And a lot of times, also they provided other kinds of social supports, so they would help them figure out things like housing or finances. They would connect them with opportunities on campus. They would help them with life issues that crop up and threaten to interfere with what they were doing with STEM Core, with their academic program.

And they really provided what they were calling wraparound student supports. Everything that a student could possibly need, they were there. A consistent presence, a single point of contact, to provide it to the students. And they were very organized and supportive. A lot of them kept all kinds of details about the students' academic details, personal details at their fingertips, so that they got to know the students and their needs and challenges, and hopes and opportunities really, really well.

One of the contextual differences we saw with this role is that from campus to campus, this position, this really key important position, was sometimes a full-time person with job security, and sometimes, it was not. Sometimes, it was a program that was funded from year to year, or semester to semester, by grants that would come and go.

And so in those kinds of situations, this absolutely key position, it was someone who was not always in place because of uncertainty in the financing. So when it was a part-time job or a job that would disappear in the summers, it was really hard for the person in that position to really fully fulfill the role that they were meant to do. But it turned out to be the absolute foundation of the kinds of supports that students needed to engage in this kind of really intensive STEM program. Carol, what do you want to add about the student support specialist?

Carol Tate:

I think we could sort of make not a parallel, but sort of tie it in, in the way that Growth Sector created a community for those student support specialists to interact online, because they were really kind of alone in their positions on campus. Often their position was not understood by other people working

there. And they faced a lot of challenges, especially in the pandemic supporting students' mental health struggles and things like that. Growth Sector played a big role in that, creating that community feel.

Andrea Beesley:

As you can imagine, during the pandemic, in general, community college enrollment went down, and so that was really challenging for an intensive program like STEM Core. So the need for the student support specialist to provide all these kinds of services, especially when students were stressed personally, or if they had illness in their family, or they had economic struggles during the pandemic, that just was a really crucial and difficult time for people in that role.

Carol Tate:

Yeah. And I think often, the student support specialists faced situations that they didn't feel they really had the training for, and that's where Growth Sector really helped by creating this online community. They started having regular coffee hours where they could all meet by Zoom, they could share strategies of how they were supporting their students.

They also got some sessions about sort of managing your own mental health when you're trying to help all these other students and help them deal with their stress. And they got a lot of good support and community, whereas they were kind of feeling a bit isolated, I think, in a lot of cases.

So I thought that was a good example of how even an under-resourced campus can take advantage of a larger community to provide better service for students.

Jenna Nguyen:

That's great. So what I'm also envisioning in my mind is that there's a community within the campus of the students, the student support specialists, and even a larger community through this network that you're talking about that is providing support at an individual level, academic support, as well as the prep that is necessary, and the work-based opportunities and the prep to get into those jobs, like the connection. I think mock interviews was something also that you may have mentioned? The workshops?

Carol Tate:

Yeah. And that's something that Growth Sector really took an increasing role in over the course of the six years. Originally, the model really had the student support specialists developing those relationships with employers and trying to get students placed, and that just became really too much, and also very difficult given the timing. Often because of the timing of grant disbursements, they weren't really onboarded in time to create the relationships in time to get the students' applications all ready.

And so that's another example of how they kind of pooled resources. Growth Sector took over a lot of that internship preparation and started giving online workshops for students from all the campuses on how to prepare a resume, how to prepare for an interview. They had students do sort of a single application to Growth Sector, which they could then distribute to employers, so they really streamlined the whole internship application process, which I think was really key.

Because one of the big barriers was really honestly from students themselves just not having the confidence to go for these opportunities, not seeing themselves as being qualified. So it was very helpful to kind of shepherd them a little bit through the process and let them see that, yes, they could be successful in an industry internship.

Andrea Beesley:

Another feature where we saw interesting variation was how campuses dealt with the accelerated math component of the model. So a lot of students come into community college who are not prepared for college-level math, which basically starts at college-level algebra. And that's a really big barrier for all kinds of majors.

But with sTEM Core, we were looking at students who were focusing on engineering, and those programs require calculus or pre-calculus, depending what they're doing. So there was often a big gap between where they were mathematically at entry to community college and then where they needed to be.

And in order to avoid spending a lot of time on remedial courses where those exist, or in places like California where they're no longer offered based on legislation in that state, there needed to be a way to get students up to speed in mathematics so that they could take advantage of the STEM Core opportunity. So the model had a accelerated and contextualized approach that was intended to have students moving together as a cohort through a sequence from intermediate algebra, through trigonometry and pre-calculus in a year.

And in reality, there were a variety of different implementations of this. There were places that did have a cohort of students who were at a similar level and who could move through the sequence like this, with all of these support. It became difficult during the pandemic to have a cohort that was able to spend the number of hours together in a week that was required to be on this accelerated pathway.

It was also difficult from the standpoint that in not every campus did they have students who were coming in at the same level, so there might not have been enough for a cohort starting at the same level to be able to schedule all of this. So we saw a lot of different kinds of approaches to the math course sequence across the network, and the level of student preparation and the contacts for the cohort model, and then the resources and organization at the college all influence that.

Jenna Nguyen:

Something that you said earlier, Andrea, was that students might not feel like they have a home in this college campus. And Carol, you said that they might not feel reflected in the STEM field.

And so I think all of the things that you have shared with us around the support that this network is providing, it's a contextual approach. It's very intentional. There's a level of calibration and recalibration that happens to make sure that students are getting the supports that they need. And I could also see that given that the community college system is an entry point or an access point for so many students, especially students who are underprivileged or underserved, students of color, first-gen students, immigrant students.

So given that, and based on your work, what recommendations would you offer to college administrators, staff, policymakers, or others who want to support students? Particularly students from underserved communities in their pursuit of a STEM career?

Carol Tate:

Well, one that I would say, picking up on what Andrea was saying about the plight of the student support specialists who often were kind of in a contingent position, would be to really invest in people. Because we saw that in campuses where these people had a permanent position, they didn't have to worry about whether they were coming back in the fall. They were able to do more long-term planning. It just made such a difference in the student experience and what they were able to offer the students.

So I think that kind of investment is really important, and these kinds of roles are often considered not that important or not requiring a lot of qualification. And we saw a few examples where they just happened to have somebody in that role who had a tremendous amount of experience, both in teaching math, and giving financial planning advice, and student services experience.

But then we saw others where the people just didn't have that much background, and it was a very difficult road. So I think investing in people is one of the lessons.

Andrea Beesley:

I think another thing that we saw is when campuses had instituted a summer bridge program, so this was these experiences during the summer where students had a chance to engage with engineering activities and see what the engineering career is like, and kind of play around with equipment and with concepts in areas that were new to them. While at the same time, that was helping to build their cohort, without having the academic pressures of the regular semester classes.

It was an opportunity for them to bond and get some ideas about what being an engineer or working in engineering would be like. And at the same time, having experiences that help the see themselves as people who do engineering activities, as a member of a group who does engineering, as someone who belongs in that context. And when at the same time, it is not as academically challenging as what they might be doing during the semester with math.

Jenna Nguyen:

Are there other student perspectives, or did you learn anything about students' academic or career pathways or the ways in which students pursue a STEM degree or STEM career that you'd like to share?

Andrea Beesley:

I think one thing we saw is that it was influential at the college whether their engineering program was aimed at the two-year technology pathway, where students would have two years of courses, be an engineering technologist, and be able to get a job right away, versus whether the program was oriented toward the transferring to a university where they would then go on to get a four-year engineering degree.

Because it made a difference on what they offered, who the faculty were, what kind of equipment they needed, and the kind of goals that they were supporting or instilling in students. And for the campuses to really know their identity and sort of support whichever pathway they were interested in, that seemed like an important part of institutionalizing the STEM Core supports. What did you think about that?

Carol Tate:

Yeah. And this is really one of the pillars that's outlined in the INCLUDES initiative, is that a program have this sort of shared vision. So in some places, we saw that the vision wasn't necessarily that shared, that there were those who favored moving students toward the technologist kind of pathway, with a view to that they would get employed and then could in the future pursue a four-year engineering degree, but that the main thing was to get them a better-paying job as quickly as possible.

And that's part because of just looking at the statistics about how many of these students actually make it all the way through to the four-year degree and how many fall off the pathway along the way, right? And that they would be more likely to finish in the near-term if they could sort of get a reward for completing a two-year degree, get a better-paying job, see themselves maybe moving up in engineering.

Over the course of the program, we saw more and more emphasis on the four-year pathway, and we even heard some faculty speculating, "Well, maybe that has to do with the people. These are academics running this program, right? They all have advanced degrees. This is kind of the world that they come from." And that was kind of a theme that came up through the project for me was that people's individual perspectives and their own backgrounds really can have a big influence on their priorities.

But also, in the case of the four-year versus the two-year pathway, I think it was really an example of how everybody really wants the best for these students, but not everybody has the same idea about what that looks like and what would be the most productive pathway for them.

Andrea Beesley:

We also found the stories of the students themselves to be really inspiring. Some of the ones that we talked to were students who were turned off to mathematics or turned off to STEM in general. In high school, they'd had some negative experiences, or they had been told things that made them believe that this wasn't for them, that they couldn't achieve this. And then later on, with additional growth, maturity, and the kinds of supports that were offered here, they were able to do amazing things in the STEM Core program.

And we also talked to some students for whom this was a second career or a third career or more, so students who were older than traditional college age, sometimes much older than traditional college age, who were looking for a career change, a new challenge. And this kind of program offered them the supports they needed to do that to make a big change from what they'd been doing before.

Carol Tate:

Yeah. We had one really interesting lunch with a group of students in New Mexico, and as Andrew was saying, some of them had just done terribly in high school, worked in retail for a couple of years, or even dropped out of high school and did a GED.

And then in the same group, we had a woman who had completed her BA, I think, decades prior in a different field and had decided to go back to school in engineering. And a man in his 60s who had been a wild firefighter, a smoke jumper in Northern New Mexico. And it was just fascinating to see how this little group functioned and what buddies they were, and how they really were this community.

And I think a lot of times, we emphasize these sort of identity-based communities, but in this group, we had a Puerto Rican mother of two from the Bronx. We had this Mexican-American guy in his 60s from New Mexico, who had grown up on a ranch. We had these two white unsuccessful-in-high-school local kids. And their camaraderie was just amazing. They just had gelled into a group.

And so I think in terms of takeaways too or recommendations, I think just being intentional about creating communities and creating the conditions for communities to develop is also a big takeaway. That particular campus was very successful at that.

And as Andrea was mentioning about the bridge programs, I think one of the professors on that campus said, "They came in for the fall semester. They all already had each other on a text thread. They were all communicating. They were all kind of already gelled."

Jenna Nguyen:

I love hearing these stories and just the students who are coming from all walks of life, and that you both have and through the STEM Core program have provided this infrastructure and this network to connect them to opportunities as well as to each other, and like you said, Carol, invest in the people. So it is really inspirational.

So what does the future look like for STEM Core for the both of you? For the students who have participated in STEM Core?

Andrea Beesley:

For me, I often think about programs that support STEM students from underrepresented groups. I think it really goes to show that however things went in high school, or whoever you are when you're graduating from high school, that this is not something that is necessarily going to determine the rest of your life, right?

The traditional idea of you go to high school, you go to college, then you get a job from college, from whatever you majored in, in college, and that's the rest of your life, I think that's not true for most people. And I think that getting beyond that idea is going to be really important to supporting people from groups who are underrepresented in STEM.

Life is long, and there's a lot of different opportunities to take advantage of. And I think the stories of these students and the support specialists who are helping them really reflect that, and I think to meaningfully on a larger scale increase participation in STEM and diversifying STEM, there have to be multiple pathways that are not what we would think of as traditional pathways, that work just as well and I think arguably make our STEM industries stronger when they reflect our population better and when they include people with diverse experiences and diverse points of view.

Carol Tate:

I think one of our takeaways, Andrea, was the sort of mismatch between the traditional academic path and today's workforce, and that the traditional academic path is kind of sorting out some people who really could be successful in the STEM workforce and how to address that because those traditions are so slow to evolve.

Andrea Beesley:

And even at community colleges, which I think are sort of thought to be closer to the workforce than maybe some four-year universities, there still is that gap between what colleges think is necessary, for example, the entire mathematics sequence up through calculus, and what companies really need, which is not necessarily that. And so the students having the internship opportunities with industry in their area is helpful, but there's still a gap between what's needed and what colleges are thinking that they need to provide.

And Carol, that probably came out too from the employer interviews, right? What they value from interns or from new employees? Yeah.

Carol Tate:

It definitely did.

Andrea Beesley:

What employers value.

Carol Tate:

Yeah. And I actually spoke with one employer who had been on a sort of White House panel addressing this exact issue, which is just workforce preparation and this kind of mismatch between some of these pathways and industry needs.

And some of it is just kind of bias of the institutions, but also employers too sometimes because of the way that they were trained. So I think in some cases, it's also a younger-versus-older employers kind of question, or the evolving workplace, and that some of the expectations or qualifications that are needed or thought to be needed are maybe really not as applicable as they used to be.

Jenna Nguyen:

I'm all about creating new pathways and breaking barriers and the status quo, so I think this is all amazing work. Well, I want to thank you both, Andrea and Carol, for sharing your time and your findings with us today. It's been an absolute pleasure.

Andrea Beesley:

Thank you. We love talking about this work.

Carol Tate:

Thank you so much for having us.

Jenna Nguyen:

Thank you for joining us on the SRI Homeroom. We'll see you next time.

Thank you for joining us on the SRI Homeroom, produced by SRI Education, a division of SRI. Andrea Beesley is a senior principal education researcher, and Carol Tate is a senior education researcher with SRI education. Learn more about them in today's show notes.

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