Broadening Participation in STEM and CTE in Less Than a Year

Presenter: Donna Milgram, Executive Director, Institute for Women in Trades, Technology & Science (IWITTS) and Principal Investigator (PI) of 5 National Science Foundation Projects

Interview Transcript:

Donna: Hello, and welcome to the closing keynote of the *2018 STEM Success for Women Telesummit*. My name is Donna Milgram, Executive Director of the Institute for Women in Trades, Technology and Science, and I want to thank all of you for joining us and me, and our 15 extraordinary speakers, and over 1,200 other educators for this one-of-a-kind change making online conference funded by the National Science Foundation.

Donna Milgram

Barbara Dufrain, an incredible woman, herself a STEM pioneer, is among a small group of women who were the first female programmers with NASA. In early 2000 she started her retirement job, teaching IT at Del Mar College, a Hispanic-serving institution (HIS) in Corpus Christie, Texas. Barbara is one of those people who gives 200% at whatever she does. And even in her retirement job, she wanted to be on the cutting edge, and she was one of the first in her college to develop a flipped classroom. And for those of you who have flipped your classrooms, you know that means many nights and weekends.

But, she's one of those teachers who really, really cares about her students, and will do whatever it takes to help her students learn. As a female pioneer, she also really, really cared about getting more women and girls into IT. She had tried everything she could think of to increase the number of women in her programming classrooms and she hadn't had success. She had very few women, and with those, she had a perfect track record. 100% of them dropped. She couldn't understand what she was doing wrong.

We met when she came to a National WomenTech Educators Training I was conducting in Boston. And we ran into each other in the bathroom during the break, and she said to me, "Donna, I now realize why all of my efforts to get more women into my IT classrooms were not working. I was focusing on the wrong target audience." She, like many others, had done outreach to middle school girls even though she was in a community college, where the average age of students is 29.

When she returned to Del Mar, she focused on the female students already at Del Mar, who already had an affiliation and loyalty to Del Mar, but who were unsure of their career pathway. And in her new approach she didn't talk about STEM. Most students don't know what STEM is. Instead, she created the Smart Wonderful Woman Outreach Campaign using some of the new strategies she learned in the training.

In less than a year the percentage of women in the programming courses she taught, four programming courses, went from an average baseline of 13% to 21%, a 62% increase. Her retention of female students went from 0%, to 86%, but male retention also increased from 70% to 93%, on average over two semesters.

Now, Barbara's story is important because many educators sincerely want to increase the number of female students in their STEM classrooms and like Barbara, they've tried everything they can think of,

and it didn't work. Now, this session will help you unlock the top secrets to success in recruiting women to STEM and CTE, so that you too can have the same kind of success Barbara did in your own schools and classrooms.

First, I'll share some outcomes from colleges that have successfully increased female participation in their STEM programs. Next, we'll review the top five recruitment secrets. We'll explore what these highly successful programs are doing that's different than what has traditionally been done. And finally, I'll answer your questions.

So, I'm going to share with you now, the results from five of the schools that participated in this Telesummit. Athens Technical College, Emerging Technologies went from only 1 female at baseline to 15 in one semester. A year later, they awarded nearly 50% of their 43 video game design and development certificates to female students. Mount Wachusett Community College, Biotech Manufacturing, 1 female at baseline, went to 9 the next semester. A year later, 57% female students.

Broward College, in Florida, an HSI, Computer Science and Information Technology. They started with just Computer Networking, went from 5 females to 15 in one regular semester, and 43 to 110 male students in just networking. And then they expanded that to the whole department, and they went from 149 to 226 women in just a year's time. 751 to 1,009 men in the Computer Science and Information Technology AS degree program.

Owensboro Community College, Automotive Technology, 2 females to 4 in one regular semester, and then to 7 after the third semester. Rowan-Cabarrus Community College, in North Carolina, Engineering Technologies, went from a baseline of 4 females to 10 in one semester.

Recruitment secret number one: choose the right target audience

One of the biggest mistakes that I see schools make, all the time, is they go after the wrong target audience. If you make this mistake, it practically guarantees that your recruitment efforts will fail. You can have the right recruitment strategies, and the wrong target audience, and this will result in your putting a lot of time and effort into strategies that won't result in even one more female student enrolling.

I call these efforts Career Awareness, and it's okay to carry out Career Awareness with middle school students as long as you understand it will not increase female enrollment in your STEM and CTE programs. Target audience is so critical that in our WomenTech Educators training, I not only go through all the types of target audiences your college should consider, I also prioritize them by level of difficulty and return on investment. Because your target audience underpins your entire recruitment and retention plan, I also provide laser coaching, to school teams to help schools choose the best possible target audience, before they start on their plans.

Now, I'm going to admit something to you. I have a bias for helping schools go after the low hanging fruit and choose a target audience, which can actually enroll into the targeted STEM program the very next semester. Let me give you an example. The Emerging Technologies program I mentioned earlier, that went from 1 female student to 15 in just one semester, had originally chosen secondary students as their target audience in their recruitment plan.

The feedback I gave the team caused them to go in a different direction, which resulted in their success. They chose to focus on an internal audience instead, prospective nursing students, 75% of whom aren't admitted because of insufficient space. The college normally loses the students who don't make the cut for nursing. So the team leader, Mark Evans, went to the Health Science Chair, and asked if it would be okay for him to do some recruitment for his program. And the chair said yes.

These students were already at the college, looking for a good career, and prepared to take science and math courses. The college changed course and with a minimum of effort, went from 1 female student, to 15 females out of 17 students, in one semester. Mark Evans shared his full story, in Session One of the Telesummit. So if you missed it, I highly recommend listening to the recording, on our conference website.

Broward College went from 5 female students in Networking to 15 in one semester, males 43 to 110. And then they rolled out to all the career pathways in their CS and IT program. In a year's time they went from 149 to 226 females. Males also increased 751 to 1,009. One of their most effective recruitment strategies was focusing on a target audience of students in the required computer and internet literacy course, which that department taught, and it served as a feeder.

They created a "Why should you study IT" PowerPoint presentation, and every single class saw that presentation, both male and female students. They estimate 1,000 female students saw that presentation, so that target audience alone enabled them to have these kind of changes.

Mount Wachusett Community College in Massachusetts, another one of our Telesummit presenters, Biotech Manufacturing went from 1 female student to 9, and then later to 13. Their primary strategy was recruiting from a target audience, which was a non-credit bridge program class in manufacturing, it was a non-credit course, and it was 38% female. 10 out of the 14 female students in the introductory Biotech Manufacturing credit courses came from this pipeline.

Another Telesummit presenter, Owensboro Community College, Auto Technology went from 2 to ultimately 7 female students. They polled them, and College Automotive Experience Days that high schools attended was a way they received 2 of their students. They also had a target audience of students that were undeclared, or unsure of their career pathway. And 1 came from an English class presentation, another from a GED program, and another from a press story in the local paper.

Recruitment secret number two: 50% female role models on the job

The key to increasing the number of women in STEM is female role models on the job. Women and girls don't think of themselves in careers as engineers, or auto technicians, or computer network administrators because the percentage of women is still so small.

Female role models help get these careers on the radar of women and girls because they're able to see someone who looks like them on the job, especially in a lab or field setting. And they think to themselves, "That might be interesting, if she can do it, I can do it too." Now, pioneers don't need female role models, they're going to do it regardless. However, if we ever want to increase our percentages beyond 8, 10, or 15%, then we need to have female role models and we need to do outreach so that women will picture themselves in these careers.

Now, what was the number one, most successful campaign to recruit women to male dominated careers? Well, that was Rosie the Riveter. She encouraged women to work in factories during World War II while male workers were in the military. This government campaign used posters and news stories about their number one female role model, Rosie. During World War II, the Rosie the Riveter campaign of, "We can do it," was a very successful campaign and educators need to send the same kind of message in their own campaigns with posters, and career videos, and images of women successfully being able to do it.

Now I want to give you some examples of how this can work in practice, in your schools, to increase the number of women. Make sure your outreach materials feature female role models, whether it's your school's website, catalog, or brochures. Make sure that female role models are represented at the rate of 50%. And because these are career pathways with very few women, you'll need some women in technology banners or posters to send a strong opposite message in your school, just like Rosie, "Yes, women can do it."

You want to imprint images of female role models on the minds of your female and male students. Let me tell you about one college that I worked with, Evergreen Valley College. Auto technology was their focus, and they had 40 years' worth of class pictures on their walls, almost all male, and of course that sent one kind of message. But then they put up a six foot woman in auto technology banner, next to all those male photos, with female role models and that sent a positive, counteracting message.

When I was doing a WomenTech Training, one of the male IT instructors said to me, "Having a banner up like this does more than just feature female role models. It says, 'This is who we are as a school, and we welcome women into our program.'" And that's the type of message, outreach and recruitment that is key to send. One of the colleges I mentioned before, Broward College, used female role models in their presentations in the introductory feeder course, as one of the most successful recruitment strategies.

We also heard, on day one, in our second session from Dr. Dan Garcia, developer of the Beauty and Joy of Computing Course at UC Berkeley, which has 65% female enrollment. He shared with us, during his Telesummit session that, "In the Beauty and Joy of Computing course, we have six guest speakers, and five of them are women. I learned that, in that way, I can bring women to the class, since I myself," he said, "am a Hispanic male. So, in this way, by having female guest speakers, and role models, we bring some diversity." By the way, the posters and these banners are in seven different career pathways, and you can find them on our website, www.iwitts.org.

Earlier in the Telesummit, I interviewed two educators from Rowan-Cabarrus Community College, Tony Bean, Program Chair of Engineering Technologies, and Tammara Walker, the Career Coach Manager and Career and Academic Advisor. Specifically, Tammara talked about the Women in Technology Outreach Kit, which provides template outreach materials that you can then customize to your school. According to Tamara, she said:

> "It really just grabbed their attention, the students. They saw a career pathway that we planned out for them. And it gave them a sense of security. That's what a lot of them were looking for. They didn't want to have to go through the layoff situation again. They felt security in those particular fields and positions. We just talked with them, Tony and I met with them, one-on-one. We told them about the various careers they could have in this particular field, and it was a go."

Tony also spoke about how they changed their brochures and made sure that each brochure had at least one picture of female students on the cover. As a reminder, before we move on to secret number three, recruitment secret number one, choose the right target audience. Recruitment secret number two, female role models on the job.

Recruitment secret number three: appeal to female interests in STEM

Now, I'm going to tell you something that is going to shock you. Males and females overall, as a group, have different learning styles, and what appeals to them and what engages many female students is different. Females care about how STEM helps others, and males care about the features of technology, overall.

Now, let me give you an example. Earlier in the Telesummit, we heard from Dr. Dan Garcia, that when he changed the course title to the Beauty and Joy of Computing and also changed his content, specifically to appeal to more female students, he was able to have success, both with recruitment and retention. And one of the ways he did this was he let students pick their own projects. According to Dan:

> "So the idea is they pick their project they've always wanted to write, rather than being thrown into, 'Well, I'm writing a Pac-Man, or a guessing game, or some kind of data simulation.' No, it's about what I care about. And if I care about a tutorial for students to learn science… One of our highlights is that students wrote tutorials for their younger brothers or sisters to do that. Well, they can do that. I also see more tutorials, a lot of female students choosing things, to teach other students, that have more meaning, and bring more meaning to the world."

Here's one more example from Dan Garcia, about how he teaches a difficult concept in a way that appeals to students and makes it easier to learn:

> "We also teach a very difficult idea, in addition to abstraction, of recursion. And recursion, is something that many people say, 'Whoa, don't teach that to non-majors.' But it's so powerful, especially if taught with a visual language, and especially if you teach it, where you're letting them create fractals, and create design patterns, and then make their own wonderful pictures, and kind of celebrating that. Rather than competing to do that, you're celebrating that."

In another of our sessions, we heard from Dr. Julie Mills, Professor of Engineering Education at the University of South Australia, about how to make STEM curriculum gender inclusive and appeal to female and male students. And here's one of the examples she gave:

> "To use applications and illustrations which span a wide range of experiences and interests. For example, consider the aerodynamics of dolphins, as they swim rather than always using examples of Formula 1 cars, or aircraft wings in fluid mechanics courses."

Mark Evans, in our first session, used drones and Sphero robots, along with other fun strategies, to recruit and engage perspective female students. Mark told us that, "While recruiting female students, I got to know a lot of people personally. And then, if they were super interested in something, for instance, one of the big things was 3D printing." And since he focused on nursing students, a lot of them were very interested in bones. And so, a lot of them wanted to know how to print a bone. He describes a Technology Nest that they have on campus:

"And they would go over and print, in 3D, a bone. And they were like, 'Wow, this is really cool.' I also showed them how to use the Blender, which is a 3D object making program, and a lot of them were, 'Wow, this is really neat. I've always wanted to do art.' And I saw that there is really a special need for this, here in Georgia, and I told them so"

Because he said that the movie industry is in Georgia and they need 3D modelers, that would lead to conversations with his students about different types of jobs that you could have in the field of Emerging Technology.

So, I challenge you to ask yourself, "How could I incorporate, into my recruitment strategies and activities, something that will appeal to female interest in STEM and CTE, as well as to male interests?" So, recruitment secret number one: choose the right target audience. Recruitment secret number two: female role models on the job. Recruitment secret number three: appealing to female interests.

Recruitment secret number four: leverage online recruitment strategies

For colleges, online recruitment strategies are the most important. Research shows that prospective college students visit the program portion of a college's website. That's the first place they go in making recruitment decisions. And, that is also a great opportunity because if you're doing something online, you can do it in 3D.

You can have videos of female role models, and here I'm showing Olin College. Their engineering program is 46% female. You see that they have half females on their home page, and if you were to click into those awesome projects they're half done by females. In addition, they really have highlighted and bubbled up the engineering that is helping others. One of their web pages is on sustainability. Here we see Emily Shackleton, who is working with a classmate during an affordable design and entrepreneurship trip to India. I have so much more about online recruitment strategies, as well as our other strategies. I'm sharing what I can in the time that we have today.

Recruitment strategy number five: partner with counselors and advisors

Let me tell you about how City College of San Francisco actually did that, and I'm going to show you some numbers from City College of San Francisco in a moment. When you get others that are helping you with doing the recruitment, then you don't have to do it all yourself. And they can provide a pipeline of female students to you.

And here we see, that City College of San Francisco went from a baseline of 19% to 33% female at a high overall increase. They have a very large college, and they made a presentation to the counselors about how they wanted to have more females. There's over 100 counselors at City College of San Francisco, and they also provided them with posters of female role models and accompanying tear off flyers.

The other thing that they did that helped them to have that kind of success was they had a WomenTech Educators training leadership team, and they provided training to all of their instructors, including adjuncts. They also sent an email to female students who met prerequisites and were in their feeder courses. And that is what helped them with having these kinds of results.

So, we've just learned the top five secrets to recruiting female students, and you have seen some exciting results from schools that have participated in the WomenTech Educators training. And I know that your schools can have results like these, and be among the innovators. I know that's possible.

So I want to just take a couple of minutes to tell you about the WomenTech Educators Training, before we go into our questions and answers. So, over 30 years I have created a 20-point System, eight points on recruitment and 12 points on retention, and that forms the knowledge base of the WomenTech Educators Training. When school teams come through a training they receive help with team building and who should be on the team. It's a combination of administrators, actual instructors, those who are in outreach, for example.

They are getting the knowledge base, but they're also developing a Recruitment and Retention Plan. I've developed a plan template that has the required elements. Then they can choose what strategies are going to work best for their school. The other thing that's really important, I had mentioned this earlier, is that each team receives both an initial Orientation and Team Building Coaching, but also a Laser Coaching on Target Audience so that right from the start they can figure out what target audience, or audiences, are going to be their lowest hanging fruit. That target audience call means that all of their recruitment and retention strategies are going to map to that target audience, or multiple target audiences, that are their lowest hanging fruit.

When they come through the training, at the end they have a plan for recruitment and a plan for retention that the whole team has developed. And I know that you know that when you're part of developing the plan you're more likely to be bought in and to implement the plan. But they also receive Plan Feedback, and a Coaching Call. They get actual plan feedback, from myself, as to how the plan could be more effective, what's great in the plan and what could make it more effective.

And they receive an audio recording and a transcript of the call. They revise the plan, resubmit it, and they get one last round of written feedback so that they can walk away with the best possible plan for implementation. They also receive Support for Implementation, as well, and then six months out from the training they make a Presentation to the other schools that are in the training as to what their results are. This is using a template. It's a 10-minute presentation. If you're a school and you have a National Science Foundation grant, or some other kind of grant or somebody you need to report to, that makes it very easy to do so. So, each school team receives 5 to 10 hours of customized coaching per team and plan feedback. They also receive our Women in Technology Outreach Kit with template materials, and the *WomenTech Classroom eBook* as well, a treasure trove of hard-to-find women in STEM resources for educators. One unit of continuing education credit is also available.

The training is available onsite in person, as well as online. The online training is available in two formats, an all-semester format over 10 weeks, where it's about 2 hours a week, 1 hour for the knowledge based, which is asynchronous. And then 1 hour in which you work on the plan as a team. There's also, for those schools who want to move quickly, this same training available in a 4-day Bootcamp. That is live, and it's 5 hours, for each of those 4 days.

School teams develop, as I said, their own recruitment and retention plans, and they're able to see results as soon as the next semester. We work with schools to find the training option that best meets their needs and their budgets. We want to help all schools that want to broaden participation. We also have a Data Detective package that's available for schools that just want help with data analysis, and

identifying their low hanging fruit, and any bottlenecks within their program. We also have, coming online, a WomenTech Makerspace Training, as well.

So, I'm really passionate about helping educators have actual increases of female students in their STEM and career and technical education classes, and improving retention of both female, and male students. It's taken me over 30 years, with lots of trial and error, and 5 National Science Foundation grants I've been the PI of to develop this system, which gets real results for diversity, and broadening female participation in a short period of time, and that you can carry out with your existing resources.

If you need help figuring out what's stopping your program from broadening participation, and how you can turn that around in a year's time or less, please sign up for a free One-on-One More Female Students Strategy Session with me. My time is limited. I'm currently working to develop a new WomenTech Makerspace Training that I'll be delivering in just a few weeks to a college team. I look forward to talking with you.

Many educators have felt like Barbara Dufrain. You've tried everything you can think of to increase the number of female students in your STEM and CTE classes. Like Barbara, you too can broaden participation in your STEM and CTE programs.

So, I see that there is a question about, ***"Is the one-on-one strategy session free?"*** Yes, it is a free session. And*, **"Do I need a team, to be successful at recruiting more women?"*** We used to give this training where individuals could attend and our external evaluators found, in our National Science Foundation projects, that we had the most success, and the schools had the most success when there were teams. And so, that is why we now only have school teams participate in our training.

Okay. I just want to thank all of you who have showed up today and throughout this *STEM Success for Women 2018 Telesummit*. I have really enjoyed these two weeks, and I so appreciate everybody's participation because you care so much about broadening participation of women and girls in science, technology, engineering, and math, and career and technical education. Thank you so much.