

40% Female Enrollment and 90% Graduation Rates for Two STEM Academic Scholarship Programs



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Presenter: Dr. Mary Anderson-Rowland, Ph.D., Director, Academic Success Programs School of Computing, Informatics and Decision Systems Engineering, Arizona State University

Interview Transcript:

Donna: Hello and welcome! My name is Donna Milgram, Executive Director of The Institute for Women in Trades, Technology and Science and I am so excited to welcome you to this session of the *STEM Success for Women Telesummit* funded by the National Science Foundation. We have an interview with a very special guest.

Our guest today is Dr. Mary Anderson-Rowland, director of Academic Success Programs for the School of Computing, Informatics and Decision System Engineering at Arizona State University. Dr. Rowland directs two academic scholarship programs, including one for community college transfer students. She was the associate dean for student affairs in the Ira Fulton School of Engineering at Arizona State University from 1993 to 2004 and was named a top 5% teacher in the Fulton School of Engineering in 2009-2010. She received the WEPAN Engineering Educator Award in 2009, the ASCE Minorities Award in 2006, the Society for Hispanic Professional Educator of the Year 2005, and the National Engineering Award in 2003, the highest honor given by the American Association of Engineering Societies. In 2002, she was named the Distinguished Engineering Educator by the Society of Women Engineers.

Dr. Rowland has over 200 publications, primarily in the areas of recruitment and retention of women in underrepresented minority engineering and computer science students. Her awards are based on her mentoring of students, especially women and underrepresented minority students. Her research is in the areas of recruitment and retention. She has achieved an average of 40% female enrollment and a 90% graduation rate for two STEM academic scholarship programs she directs at Arizona State University. Isn't that outstanding?

Welcome, Mary, and thank you so much for joining me for the STEM Success for Women Telesummit.

Mary: Thank you, Donna. My work has been primarily with transfer women and men but in general, what I am going to be talking about today works just as well for native students. A lot of what we'll talk about is going to be tough love, which is good for a lot of students. I also just want to let you know that when I use the word engineering, I'm including computer science. It's just a little easier to just say the one word, but I am always including computer science in that word.

Donna: Great. So, that is good to know that we're talking about both and that these strategies also work for native students in addition to students of color and students, in general. Before we dive into the information about the strategies and the tough love, I would like you just to share a little bit about the before and after numbers so that our listeners know these strategies really work and set that up.

Mary: Certainly, Donna. Nationally, in general, 70% of transfer students who go to colleges and universities graduate. At ASU, 70% of upper division transfers in engineering and computer science graduate, but this number is only 64% for females. Now in our scholarship program, we have 95% graduation rate for both men and women. Then nationally if we look at the number of engineering graduates who go right on to graduate school, this number is estimated to be at about 20%. We know at ASU, in general, about 11% of transfer students continue right on to graduate school. However, in our program, we now have 50% of all transfer graduates going right on to graduate school.

When we first began in 2002/2003, we only had 30% of the transfer students went to graduate school and about 40% of the native students. Then it grew to about 50% of the native students, 40% of the transfer students. In the last several years, we have 50% going to graduate school for both transfers and native students.

Now, we have to keep in mind how fantastic these numbers are because these students all have unmet financial need and 60% of these scholarship students were females or underrepresented minority. Also, on top of that, many of these students are first generation students who have no role models.

Donna: That is amazing. When you say first-generation students, first generation going to college, is that right?

Mary: Right, going to college. Some of that means that they didn't even go to a community college. So, there isn't that usual encouragement at home or the general kind of support. Parents might want to give it to their students but they might not be able to because they never experienced college.

Donna: That is amazing. 95% retention rate and 50% of those students going onto graduate school, even though they, as you say, majority are first generation going to college. You are comparing it to both national numbers and the numbers that the overall school. And so, these are students that are generally less prepared when they are transfer students. Yet, you have these amazing results.

Let me just ask you one question, can you define native for our listeners? Who are you referring to when you are talking about native?

Mary: I'm calling native students anyone that is not a transfer. So they started school as a freshman, they started at the college as a freshman. They didn't go through a two-year school first. However, we do have some transfer students that started a four-year school, didn't do well there, and then transfer in. But that is not a very large majority of the students I am working with.

Donna: Okay. So it sounds like your strategies work for everybody. That's a win-win.

Mary: Yes, it really is, with special attention to the transfer student.

Donna: Okay. So give us a little thumbnail sketch of your STEM program for transfer students. I know it's sponsored by the National Science Foundation, but give us a little sketch as an overview for our listeners.

Mary: Sure. The program is essentially composed of three parts. The first part is a scholarship and we give a scholarship of \$4,000 per year. Now, that may not seem like a very large scholarship, but our tuition is \$10,000, which is very reasonable for a university, so it's about 25% of tuition, but each year we have many more good applicants than we can award scholarships, so we also started having a \$300

scholarship. This is for students who qualified, but didn't get a scholarship. If they attend the scholarship class and get an A, then at the end of the semester, they can get \$300 and they can do this for up to two semesters. We know that the class that we have, the academic success and professional development class, is so important for these students. Obviously, the \$4,000 scholarship also helps the students so they don't have to work as much and in some cases, they don't have to work at all.

Now the academic success and professional development class is required of the students who get our scholarships. I am firm believer that just giving money doesn't help a student learn or do well academically necessarily. They need encouragement; they need assignments that are going to make them do what they need to do. So if you just have seminars and workshops that don't have credit or a grade, you can give a student assignments, but it's very unlikely that they are going to complete those assignments. But, if you have a situation well, here are the assignments, you need to do these, if you don't do them and you don't pass the class, your scholarship will not continue. So there is a little bit a part of the tough love on this.

The National Institute for the Study of Transfer Students is a firm believer in tough love, also. They will sit and tell you that transfer students have so many choices to make. Part of the problem sometimes is not being able to make that choice so don't give choices. Tell them what to do, they will follow it and they will succeed.

The third part of this is a center for transfer students. We call it our METS center. METS stands for motivated engineering transfer students. It's their home away from home. You need to understand that ASU is the largest university in the nation and we have the largest single campus in the nation. This is the campus on which our transfer students in engineering and computer science reside. So they have come from a small school where it is easy to park, and now they are in large classes, a pretty impersonal situation in many cases.

We have 300-400 students, transfer, students, 70% are transfer students, so 300-400 students that frequent our center each semester. They do networking, they can do studying, if they came from their community college and they are in a different major they don't see the other students from their community college, but if they come into the center they are likely to see them. They can study, we have a refrigerator and microwave there, and they can eat their lunch. It's run by a director, and this director is an engineer. She has both a master's and a bachelor's degree in mechanical engineering. She worked as a mechanical engineer, also has an MBA and is familiar with entrepreneurial business. Her husband started a business so she is a fantastic resource for these students. She can help them with their résumé. She can help them if they come in with three job offers, which one should I take? Those are the problems she loves to have. The students say "Hey, talk to me." She can tell by the way they present it which job they really do want.

In the center, we also have several transfer students manning the desks at all times. So if students have a question, they don't have to wait for an appointment. They can just walk into the center, talk to a student anytime and get help. Just to give you an example: here's a student who is taking a class, and they're told, excuse me, that they have to know MATLAB. The student has not had MATLAB so they'll walk in and say "What do I do?" Well, the students will either know or know someone who knows that they can direct them to a certain website and do a tutorial and say "Okay, this is a three-hour tutorial but if you go through it carefully, you'll be able to pick up what you need for Mat lab for this class." So

they can get their problems solved. That's one of the biggest problems for transfer students — they don't know what they don't know.

Now the academic success class which is this third part, we have 7 classes that last 75 minutes each semester, plus an 8th class. The 8th class is for any new students to the program who don't know the 'Guaranteed 4.0' plan by Donna O. Johnson, and we'll talk about that a little bit later. It's basically a system to learn how to learn and how to manage time. So, the number of students has gone up to 175 at one point. We then met six times so that each time only 15-30 students would meet. In order to find a schedule that works for all engineering majors and computer science students, there is no way we can just do it in one class period. So we each class is repeated, done 4 or 5 times depending on how many students can come each time, and which section they want to go to. And then we always tape one of the classes for make-ups. It's pretty hard to do a make-up when you're dealing with large number of students.

In this class, they learn college career preparation, like résumés, elevator speech, how to work a career fair, how to interview. We encourage them to develop an interest or a research area. And we tell them if you don't choose a company, we will choose for you and you will get some of the least popular areas. We assign a research paper to the students, and that intimidates some of them, so we cut it back a little bit to an interest paper. Certainly, they can write about, do some research, get some more information on something they are interested in or something they want to learn more about, and then work their way to a research paper. We also encourage them to do an internship. While they are doing that internship they look around and see what the bachelor degree student degree are doing, the master's degree engineers or the PhD, see what they are doing, and then you decide based on what you would like to do what degree you should get.

We also encourage them to get the research experience for undergrad situation sponsored by NSF all over the nation each summer. We want them to research their positions and also apply to the research programs that we have at ASU. My co PI is Dr. Tony Rodriguez and his role is primarily as a research lead. He will work with the students to help them formulate a problem. We also do mentoring. If it is only their first or second semester at ASU then we want them to have a senior student or a graduate student that is in the program become their mentor and help them through their first semesters.

Then there is the graduate school emphasis. We deal with a lot of students that have a lot of myths about graduate school. Most of them think the only reason you would go to graduate school is if you wanted to become a college professor and/or let's say I don't know exactly what I want to do, so I'm not going to go to graduate school. Or, if I get a master's degree, I'm going to out-price myself in the job market and it will be lot easier to get a job if I just have a bachelor's degree. Or, why should I pay for it? I'm going to let the company pay for it. We emphasize that is a very difficult way to go. It is very difficult to work 40 hours and then take one or two classes a semester. If you are taking one class a semester, it's going to take you 5 years.

Some of them are very afraid of getting into debt and we encourage them and say there are two good reasons to go in debt. I couldn't say this for all majors, but if you are an engineering major or computer science, then either buying a house or taking out a loan for your education and especially graduate degree is a good investment. Why? Because you are going to get into the more challenging, exciting areas. It's the ticket to get into these areas in a lot of these companies.

You might ask, "Can I work on this project?" and they will say "No, you need to have a master's degree." The money is incidental. We are seeing if the students start out \$10-\$15,000 more if they have the master's degree, I could tell you about a student who had to borrow \$10,000 to go to grad school for a year and his starting pay was \$15,000 more than his colleagues who didn't go to graduate school.

In our program, we have two classes that we hold each year, always, and that's the nuts and bolts of graduate school, which is given by graduate students, and a graduate student panel. This is the most popular of our meetings. I should perhaps say that in this meeting, this academic success class, we have both native students and transfer students and graduate students who went through the undergraduate program. The only graduate students who had to go through the undergraduate program and we have some scholarship money for them.

So, as an example of what the students might learn from this graduate student panel, here's a student Eva, who listened to us, to tell her that she needed to go to graduate school, but she said no. She knew she didn't have to. She was going out after her degree and get a good job, and maybe she would do it later. Well, she got out and the jobs she was interested in all asked for three to five years of experience or a master's degree. After hitting this same wall time after time, she's back in graduate school after a year-and-a-half and will actually graduate this semester. Then she told about a friend of hers who had sat next to her in her aerospace program and had said, "Why would you want to do graduate school? I'm going to go work my way and make the money." Well, the student did, but was not at all happy with the job that he got and his bachelor's degree and is now back in graduate school. So, she is actually ahead of him now.

Just a couple more things that we do. One is a portfolio. We work with that and you can even have an interview portfolio that can really help you stand out. We want the students to attend the research seminar, go to a company information session, things that you don't normally get or learn in a standard classroom. Then there are two other papers that we have them write. One is a ten-year plan after their bachelor's degree. Again, 90% of our transfer students have unmet financial need so they are not thinking graduate school. They are thinking "I just want to graduate, get the big bucks and live happily ever after."

We are asking them to plan out ten years past their bachelor's degree. Where do you want to be? What do you want to be doing? Another great exercise is for them to read the book by Richard Carlson *Don't Sweat the Small Stuff at Work*, pick out three to five of the rules that you need to work on, such as don't keep people waiting, don't procrastinate, say things positive, avoid the negative, such as "Well, I have to go to school today" rather, "I get to go to school today." And they work on those rules for a semester and then write a paper at the end on how they have done in upgrading their habits. This is a really good thing to carry on into their career. That gives you a big thumbnail.

Donna: Wow, I have so many questions that I want to ask you about. What I'm seeing and I'm listening and what I see is that one, you have the scholarship component, and if I understand correctly, you have some students receiving the full scholarship of the 175 that go through, and some receiving just the \$300 scholarship. Is that right?

Mary: Right. And then there are other students in the class who are not getting any scholarship. Now I should also tell you, I no longer have 175. My college has recognized the value of this course, so two years ago, they started offering a one-semester, one-credit class. It's just a one-and-done class for new

transfer students and so a lot of the students now are going into the one-credit class. In my two-credit one, I have the scholarship students with the \$4000, the \$300 scholarships, and then other students who by word-of-mouth have said this is a great class and take it. And we get a lot of referrals by academic counselors.

Donna: So that's fantastic, I'm hearing two things. One, your school has institutionalized it, which is wonderful.

Mary: It's a big part of it. It's a simplified version of what we do. It does not include the 4.0, for instance.

Donna: Which I know is really important because I've started to think about that in my training after you presented to our colleges and my CalWomenTech Project. Then I'm hearing there are students that are participating just getting small scholarships or none at all, but because they've heard the value of it. That is wonderful because that really gives also some hope to those who may want to replicate this but may not have necessarily the scholarship money. It's that valuable. So that's one component.

Then the academic success class: 7 classes, 75 minutes. Then an 8th class of the 4.0. That's not a huge investment of time, considering the kind of results you get if you go through the program. 7 classes, 75 minutes, maybe 8.

The other thing that I want to call out is your transfer center. I've heard you speak numerous times what this provides is the community. We know, especially women and students of color, are often few in engineering and computer science. It provides them with a really safe place where they are going to feel connected with each other and provide that community which we know is actually really critical in addition to all the academic things. That community piece is really served by that center and you both have a formal faculty director and then you have students who are actually transfer students who are staffing it. I'm just curious, for our listeners, is the director actually a full-time position or part-time position?

Mary: She is actually 70%. We do not have the center open in the summer. 70% is by her design, her choice; that's the kind of job she wanted. We figured that worked well. She does so many things, she supervises the students, and she helps make sure they have things to do. She's also in our step grant that we have with the National Science Foundation. We do a lot of work with the community colleges. Each semester, they bring a van of students to our center. So she coordinates that and coordinates our visits to the community college. So she coordinates all of that as well as being a personal advisor to the students and running the center. But she does it at 70%.

Donna: Great. So the other components that I heard before we go and dive into more detail on the strategies, is that you have a mentoring component that also connects the students with the industry and those pieces are really key. Then, you have your graduate school component. It may exist elsewhere, but it's the first time I've heard of a nuts-and-bolts class of going to graduate school. When you think about it, especially for students who are first generation going to college period, you would see how important it would be to have a nuts-and-bolts course on graduate school. I don't know if you're the one who came up with that panel idea, oh my God! That is just wonderful! Having a panel of similarly situated students who have gone through your program, about the graduate school — that's wonderful. I love it.

Mary: I'll tell you we just had that class about a week ago. For one of the panels, I was actually able to have six students there and 4 of them are working on their PhDs. Two of them are no longer in the program because they are getting other funding, but I asked them if they would come back and talk and they are only just too glad to do that. So, you can give the students a lot of perspective. For instance, a lot of students don't know you can do a direct PhD. You don't have to sign up for a master's program first, which some students want to do. "I'll decide then if I want to go on." But you can start your PhD program right away, which really enhances the probability of getting funding. The funding goes primarily to PhD students. So that was very valuable advice and for the students to see and hear.

Donna: The one other component is the internship. I personally am a huge proponent of work-based learning activities at all levels of school, and the reason why is you know the reality is there is not a level playing field when you get to the workplace. In our organization, we have had a new Workplace for Women Project. We work on the employment side as well as on the pipeline and education side, but it's not equal. I find that students that have done internships, work-based learning experiences, the substantial ones, they have so much more information and knowledge. It really gives them an advantage over those students who did not. So I think especially for female students and students of color, which are very few in the field, and probably going to be one of the very few if not the only one on their work site, that really gives them an advantage. I really wanted to call out the internship portion of what you do as well.

Mary: Yes, and that's why, in general, you are not going to get a preparation in the normal classroom for how do you get an internship. We have a fantastic career services organization in the college and university, but we have the director of career services come and give one of the meetings and the suggestions that she makes to them and we give them a template, not a template, but a guide for how to improve their résumé, what kind of questions to ask when you go to talk to a company.

Following the advice that she gives and the advice that we have in our class, we have the students, difference between day and night. Perhaps, they went to a career fair their first semester; they went to the class the second semester they learn what they should be doing, and then they follow these guidelines. They are getting the interviews and getting the jobs. So, there's a lot of preparation work that needs to be done in order for a student to secure an internship.

Donna: That's a good point. They are getting the same skills they need for getting a job. Once again, if your family has not worked in the kind of jobs that require the kind of interviews, etc. that you would have for engineering and computer science, you really need to have some experience. The internships provide that interview experience in addition to the workplace. So let's go back to your academic success classes, of which there are 7 plus the 4.0.

Could you just talk a little bit about what the content is in those classes? I know with the kind of results you've had with students that are considered to be among the least-prepared or harder to serve than other groups, everyone is going to want to know what is in those classes. What are the elements that are in the classes so that they can recreate it in their colleges?

Mary: Okay, so the first one I told you they need to take it's about 45 to an hour session on the 'Guaranteed 4.0'. And then the next meeting that we have sometimes, usually the first one of the semester, I go over success tips. We're going over a lot of those today in our conversation. Don't carry

too many hours, don't take more than one lab if you can help it and certainly not more than two. So, it's that type of information and getting acquainted for the first meeting.

Then there's a meeting with the career services. There's another meeting that we will have, we'll bring in maybe one or two companies at most a semester and I like to bring in a woman or underrepresented minority, if possible. If there is a team of them, at least one of them is an underrepresented. These are select engineers that have a graduate degree. They have about an hour to present: 30 minutes on their company and the other 30 minutes, I give them a list of questions to answer. Do you hire master's degrees? What do you do with graduate students?

I want them to tell what the difference that they've had made in their own lives by the fact that they have a master's degree. I can think of, for instance, a young man who talked. He had been on a submarine and he told a whole bunch of things he had done. He said he would not have been able to do any of those things in his company if he didn't have a master's degree. I want the students to hear from the horse's mouth. If they go and ask someone who didn't do graduate school, "Do you need graduate school?" Well, they will say no because they did not do graduate school and they are doing okay. They don't know the difference. By having people with a graduate degree really helps.

At least in one of the meetings, I have Dr. Rodriguez talk about research: how you do a research paper, how you get into research, and just urging and encouraging students to get passionate about one area. I told you we have the graduate panel for one of the meetings. We have a nuts-and-bolts of graduate school and we may bring in other speakers.

The director has given a talk on when you are looking for a company, you are not just looking for the company; you are looking for a career. She goes through the different types of company organizations, hierarchical or matrix so to help the students understand that there are differences in companies. For example, to do some analysis and determine which type of company would be best for them and how you get promoted and how promotion letters are different and why kinds of questions you need to ask about that. So that's another type of meeting we have.

The last meeting of the year is our celebration meeting. Sometimes, I may bring in slides from Egypt and talk about some of the engineering that's done there, just to give them a little bit of an international focus. Since my son lives and works in Uganda, some pictures of Uganda and maybe some pictures of 5th and 6th graders that we've tutored in math.

I also should tell you that these aren't planned, but as students have very interesting projects, I will ask a graduate student to run a meeting. We recently had a meeting where a computer science student took a biomedical and computer science course. Learned about biomedical information stuff, and then got on a project with a doctor at Mayo Clinic. He's actually working with them in an emergency room situation where he's doing the computer science part, and they need to know by law if a person is in an emergency room, the doctor needs to see them in a certain amount of time. They didn't have a good way of timing that. But if there is a device on the doctor and a device in the room set up, and as soon as he comes in the room and is near that patient it will be automatically recorded and when he left. We noticed that our graduate students often expand a lot by taking a master's degree or hone in on what they really want to do. So I will ask the graduate students to present their work. This way, the students got to see and play with a virtual keyboard for the first time. So that.

Donna: What an exciting project!

Mary: Yeah, that's pretty much the program. The students are in there for years, sometimes. So they may be in there two years, three or four years. If they come in as a first semester transfer, it may take then two-and-a-half to three years to graduate, and then they are in there for graduate school. So by the time they have done several of these programs, I try to give them some different assignments than the undergrads. We've had them read books such as *Who Moved My Cheese?* and *Women Don't Ask*. I have them read that and then discuss it and do a small paper applied to that book.

Donna: I think that is such a wonderful idea. I am embarrassed to tell you, I have not heard of *Women Don't Ask*. I'm going to go myself look this book up and get it. The others you've mentioned I have heard of, and what a wonderful thing to incorporate into your student success classes. The one thing I want to call out is the 4.0 because I know in my WomenTech Educators Training actually teach about 4.0 because of your teaching me about it and the kind of difference that it makes. I believe you taught time management without 4.0 and it didn't have the same kind of impact. So can you talk a little bit about this off-the-shelf, 'Guaranteed 4.0' program? That is something that others could easily get themselves for their schools.

Mary: Certainly. I had been running these seminars and we always had time management as a part of it. I can tell you I even listened to Donna O. Johnson present at a conference and thought, "Yeah, what she is doing is kind of what I'm doing." I'm okay. But, when I did evaluations at the end of the semester, one of the questions would be "Has this seminar series or these workshops, have they helped you academically?" Most of the students would say no. I would think about it, I thought about that and say that's right, I'm really not doing anything. I'm helping them with a lot of other things, their résumés, and how to interview, but that's not helping him get an A in thermodynamics.

So at one conference, Donna O. Johnson said, "Mary, I've got a new book. I want you to read it." She gave it to me, I read it on the airplane on the way home and thought "This is great. I've got to do it." I started it the next semester and what a difference! Her detail in time management is not just another schedule. But you're putting on there the things you need to do, which are incorporated into the process. For instance, you need to get to know your professors, so that's going to be a half-hour time scheduled on your weekly schedule with each professor. You're going to carry along a list of when their office hours are and you'll know where their offices are. So if you're walking across campus and say "Oh, I've got a little bit of time, I'm right close to this professor," you can go and talk to them.

It's based on research. It's a learning system. The key components are: you read the material ahead before class. This way, you can be noting and taking bullet point notes; that's a whole other system I won't go into the details about. The bullet points are from the main parts; you're not recopying the text. You are putting down the main points and noting what things you think are important and what areas you have questions on.

So then when you're in class the next day and you hear something you hadn't read, the professor talks about it again and you still don't understand it. You can now raise your hand and say "I went over this last week and I didn't understand. I still don't understand. Can you explain this in another way?" And you'll know most people haven't looked ahead so you know your question is a good question for everyone. On the other hand, if you haven't looked ahead, you won't ask a question. There could be 12 pages illustrated step-by-step in the book but you don't know because you didn't look. Maybe you

didn't understand in the class but it's good in the book. But if you read ahead, you'll know. Then you take your notes in class.

Then there is good classroom behavior that you go through. You do bullet point notes right after class; that means you don't have classes back to back. You start the assignments the day they are assigned. You can get stuck on a problem for 20 minutes, you stop, go to something else for a while. You go through bullet point reviews. You go through the quizzes and the tests you get back and make sure you go over everything you got right as well as wrong. Make sure you really understand the material.

The other part of this is you get 8 hours of sleep a night, and that's what makes it tough to really follow this. You've got regular meals. With students that try this, the reason it's called the 'Guaranteed 4.0' plan is that Donna O., when she first started this plan, said "Okay, you've done my training, if you follow exactly what I say in this plan, you will get a 4.0. If you don't, come and tell me I will give you \$100." She's never given out \$100. A few years ago, a young man came to her and said I'm going to be your first one to get \$100. So he started out the semester.

At the end of the semester, she didn't hear from him, so she looked him up and said "Hey, what's happened?" And he said, "Well, I sort of got a 4.0." And I've seen this with students. I've seen a student with a 2.6 follow the 4.0 the next semester and got a 3.98 and then figured he had it made. He went back to his old habits and next semester was right back to a 2.6. So it's a process and you need to keep doing it. It's a plan. It's based on research and allows the student to avoid cramming. There's no reason if you follow the plan that you will be cramming the night before the exam.

Donna: I think this is so important for multiple reasons. First of all, for our listeners, Donna Johnson herself is an engineer, and this is very much an engineering kind of process that she created. I know that schools actually use it in non-STEM subjects as well. I think in particular, it's important for women in STEM subjects and here's why: the literature shows that one of the reasons that women in engineering will give that they don't want to continue is that the workload is extremely heavy. In the training that I do, I also talk about how to help all students, but female students in particular, to be able to prioritize their work and hone in on what's most important. Sometimes, they will try to do everything, read everything. Of course, that is overwhelming. It is true that there is more work in STEM subjects, but a 'Guaranteed 4.0' method helps with time management. It helps address the concern of female students in engineering that there is too much work.

I remember one of the things that you told us, and I've since ordered 4.0 and as I say we talk about it in our trainings, is that she not only incorporates the work that you're doing, but she also incorporates what I would describe as self-care. Sleeping, eating, and connecting with your family. If you are religious, going to church or synagogue. She really provides a plan for life overall; it's not just about the work. You really map it out. That again is important because we know disproportionately as a group, female students need to connect with family, community; that's really important to them, and they're not willing to just only study, study, study. This gives them a method to have both. This is good for male students as well to have both. Everybody is healthier when you can do something besides just study or just work. I'm so glad that you told me about 4.0 so that we could share it in our WomenTech Educators Training with others.

Mary: If it's okay, I would like to say, in general, that you are not going to find this book in bookstores. It's found on the web and if you Google 4.0, you can get all the information. I want to say also she has

now a book at the high school level, which might interest some of our listeners. Your point about it saving time absolutely, that is one thing I didn't mention. I have students who were getting 4.0 before and then they see the 4.0 method, they are still getting the 4.0 but they are now doing it in less time. It is a very efficient way to learn material.

Donna: Yep, I got a 4.0 in graduate school. Maybe that's why I have an affiliation towards this, but what I like about it is that you can do yourself. It's not very expensive. She does have her own website. It's the only place that she sells it, and I can tell you Mary and I are not related to her. We're not in any way benefiting from this financially, but it's really off-the-shelf and guidance both for the instructors, professors, teachers and also the students. Because we just have about another 10 minutes, I want to make sure we get to recruitment.

Many of the people who are listening are with 2-year colleges, and they would actually love for their students to go to a 4-year program like yours, and then eventually go to graduate school. I wonder if you could reverse engineer for us, how do you recruit students into your program from 2-year colleges? I find so often that 4-year colleges overlook 2-year colleges. Yet, you have focused and made that your target. You've empowered them to be so successful. Could you talk a little bit about the recruitment side of things and how you get them there?

Mary: Certainly. I started first working with community colleges in about 2002, and then I was working with large, local community colleges. Those are easy to recruit at. We would set up a "Be an Engineer" day or event and, of course, we had liaisons at each community college. At this one-hour event, we would focus on having role models because it was local. We could take our students, especially if we went to a local community college, and we would ask students from that community college to talk about why they chose engineering and why they transferred to our school. We would also have some local engineers in a panel, and they would say why they are an engineer and what they do. So it would be an education because we need to understand. At the very bottom of all of this is, in general, no students know what engineering is. They have no idea.

Hopefully, we can get to talk about that a little bit more. So you serve pizza. So you have the posters out and the signs out, and say "Be an Engineer" and the students come. You will get 50-100 to 125 students, no problem. You're working out with math and engineering professors and perhaps, they will let their class out for that event during that time. I do suggest that if the professor does that, he should tell the students he will be at the event to make sure with the attendance. Sometimes, if you let your class out for an event and the professor doesn't follow up, the students won't go to the event. So that's at a large local college.

Now the last six or seven years, I've been focusing on non-metropolitan community colleges, those real community colleges. These are schools that are three to four hours away from ASU. In general, they have smaller attendance and smaller number of students in their classes. We tried "Be an Engineer" day with them, and it just did not work. So we decided what we needed was a captive audience so the only way we can do that is to go into the classroom. So our community college liaison sets up a schedule for us and we go and visit in the classes.

We go to math classes all the way from college algebra through differential equations through the engineering classes and intro to program class, anywhere where there is potential. Now we know of the engineers that came into our program. 30% of them did not know what they wanted to major in when

they went to the community college. 30% of them decided on the engineering at the community college. So we know there are a lot of students there in the beginning math classes that don't know what they want to do. Some of these professors are quite reticent to give us any time at the beginning, so they'll maybe say well 10 to 15 minutes, "I've got so much work, I can't give up a class period." But usually after we come one time, they'll let us have 30 minutes and then pretty soon we're getting the whole class period. We tell the students, it's a win-win. We're not here to pull you away. Stay here at your community college as long as you can. Take all of the math and science that you can and engineering and even if you aren't going into engineering, take all the math and science you can. You've got good instructors here, you've got a small class, and you're getting a lot of help. If you take as much math and science as you can and you choose to go into a non-technical field, someday, you may find that there is no job in that and you need to switch. We have students that come back and need to switch to a technical area to get a job, but if you've already had the basic math and science, it won't take you that long. You don't have to do a degree all over.

Our goal in visiting these kids is to get engineering or computer science on their radar. Most students aren't thinking that at all. We were the first engineering professors to be on campus with these five schools and talk about engineering. First engineering professors ever on their campus. A male colleague is Hispanic, he is an EE, and he has done research in aerospace. I'm, of course, female and have done industrial engineering. Many have never heard of it. So between the two, we make a very good tag team. We encourage and try to engage the students. We get them to say what do you plan to do? Or what choices are you looking for in a career? And whatever their answer is, we turn it to engineering. So if a student wants to be a pharmacist especially after the pharmacy ads have been on TV, so I'll say have you ever thought about going into chemical engineering? And maybe it would be more fun to design the drugs instead of to just count them out. They want to own a company? Well what kind of product are we going to have? What kind of manufacturing process? What kind of marketing? Well, they have no idea. Well, maybe then you would want to be an engineer to find out about the processing and if you're interested in business then maybe you want to think about industrial engineering, which is a combination of computer science, business and engineering. You're going to med school? What about biomedical engineering? That's one of the best undergraduate degrees you can have.

We advise them not to take a pre-law, pre-med, pre-something; get into a regular major. We also offer mentoring to them and say if they are interested, we can connect them with an engineering student at ASU and they can talk back and forth via emails. We don't get a lot of students to take us up on that, but that is something that we offer.

Then, what really helps is we invite the students to visit the transfer center at ASU, and the liaison at each community college each semester brings a van-load of their students each semester from their college. When they are at ASU, they see the support system, even though it's a big school they now see where they park and where they would come to the building. They see our transfer center. They now know some people. We eventually have them talk with transfer students from their college so they'll know students that have come from their college are at ASU and making it and doing very well. And, of course, we advertise our scholarships and that is a very important step in giving hope to the student that they can afford to go onto a university. That's the hard part — to keep having that money.

The other things that students really want to hear when you are talking to them at these small towns are really hurt by the recent turndown, so money and employment are very important to them. We

make sure that they know that the highest salaries among bachelor degrees are engineers. Engineers have the lowest unemployment rate. We also do research by giving surveys to these students to help understand what they think about engineering. For instance, they may think that being an engineer, you're really not helping people, or if you're in engineering all you're really going to do is work with machines and motors. Or if you're in engineering, you have to love math or like math. So we try to go through a lot of those myths those students have to try to get their attention.

Donna: Well, I have to tell you that it sounds like with your presentations, there's not even an opportunity to be anything but an engineer. I am just amazed at the creativity and also at your system, because you have a system around doing it. One other thing I want to ask, and we are going to have to close, because we are coming to the end of your hour and I know you have so much more to tell us, we are going to be doing other telesummits, so I hope you'll join us at one of those. Before we close, I do remember you telling me you're doing some virtual recruitment as well? I'm thinking that that would be interesting to others who are also in rural areas.

Mary: When we go to the schools, sometimes, in the class setup, we talk to their online students at another campus. In that way, we have some students right in front of us and we are able to reach additional students who are online students with that class. You were referring to that?

Donna: Yes, so there is a virtual component as well. So, good! Good, good, good.

Mary: Then we have a website also that I haven't mentioned. As you said, we've got a lot more to talk about it. We covered about 4 questions out of 12 I think.

Donna: Will you come back? Will you come back for our next one?

Mary: Certainly. But, I think could I end to take a minute to talk about the theory that our algorithms are based on?

Donna: Absolutely.

Mary: There are three main things. One is grounded theory. We have been talking and working with students for years. For example, we talk about graduate school even if we are talking to a kid who is just taking calculus at a community college. We thought that that would scare them out, but we wanted them to know what our program was about. Here, the students are just getting going in engineering, they have the big jump to even go to a university, let alone graduate school; that alone is going to scare them out. Through focus groups, we found out later that actually that is why they chose us. They came to ASU because they knew we would encourage them to go to graduate school. That was something they kind of had in their mind but didn't really believe that they could do it. So, we do surveys and we find out about these students.

The second area that we rely on is social cognitive theory. If you look at that, you can see how that fits very well with what we are doing. It's saying that your background is going to have a lot to do with your career choices. Certainly, that's what happens with us, with our students. The fact that they are growing up in a small town where unemployment is a problem, they consider that in their choices.

I could go into that more, but in the interest of time, the third one I want to mention is Tinto, who, Vincent Tinto, who recently wrote a book *Completing College: Rethinking Institutional Action* and he points out there are four conditions within colleges and universities that promote retention and

graduation. One of them is expectations, high expectations, and we certainly have high expectations for our students. We expect them to graduate and we expect them to go on to graduate school. We say money is not a reason not to go to graduate school. Again, they will be able to pay off their loans in a couple of years. Support, academic, social and financial support. We've talked about that today. The fifth one is feedback, and the assignments in this class are just correct or not correct, they just need to get them in and if they do all these assignments on time and come to the meetings, they will get an A. In fact, they will get an A+ so that helps the students, gives them some feedback on their work, but most of that feedback is going to be in the actual classes. Fourth, involvement.

We really encourage our students to get involved in student organizations. Normally, one in your major area, in ASME if you are mechanical, IEEE if you are electrical. And then one other one, such as SWE, the Society of Women Engineers, or SHIP, the Society for Hispanic Professional Engineers. So those two organizations are quite large and very strong on our campus. Also, there's the National Society for Black Engineers and the American Society for Engineers and Scientists. So, we want the students to get involved.

Also, cramming in these last couple things: we don't want these students to be a "PCP" student, and that means they come in the parking lot for 'P', they go to class for 'C', they go right back to the parking lot and drive home. That's a very lonely life, it's not very happy, it's not very fulfilling. We encourage them to spend as much time on campus as they can. That's when their study groups are going to be meeting. By the way, that's another way to be a part of this is to be in a study group for every class. We tell the students that when they graduate, they are not going to have a crown that says, "I did it myself." That is just not going to be rewarded. Engineering is a lot about teamwork and companies need to know that you like to work with people and you are a leader. By being a leader in a student organization, you can show that.

One last point about women and underrepresented minorities: in order to get them into our program, we not only send an email to new transfer students, but I make a phone call. And that has been the difference. In general, underrepresented minorities and females don't have a high self-perception. I will call them and say "Look, according to everything I see, you qualify for our scholarship. Have you applied? Are you going to apply?" And they'll say, "Oh, I don't think I'm good enough." And I'll say "Hey, your transcripts are very good and you qualify." So with some prodding, they will apply. That's how we get more women and underrepresented minorities. It's legal; we advertise all our scholarships on the web so everyone knows about it, but you're allowed legally to make phone calls to some students that need that extra help to even apply in the first place. So that's my main tip there.

Donna: Actually, our external advisors found and our own National Science Foundation Project that of the top three strategies, personal encouragement was one of them. The nice thing about personal encouragement is that it's a free strategy. We actually have a personal encouragement conversation script and talking points. Can't emphasize it enough.

Mary, I can't thank you enough for spending this hour with us in the STEM Success for Women Telesummit. I want to let you know that you are one of my role models. You have made such a difference in the lives of so many students from low-income backgrounds, and really given them the opportunity to excel and make a difference in careers in engineering and computer science. I want to let you know that truly you are one of my heroes. I thank you so much for speaking with us and your

contribution to the field of broadening the participation of women and minorities in STEM. It's really a privilege to have you as a presenter in our Telesummit.

Mary: Thank you very much, Donna. I appreciate it. This is a passion of mine and I appreciate this opportunity to share what I've learned with others and hopefully, they will be able to get the same reward and enjoyment back when you see that you are able to really help and change students' lives.

Donna: I hope you'll come back for our next Telesummit and share more of your strategies. Thank you so much.

Mary: I'd love to.