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# *Committee Meeting*

of

## ASSEMBLY EDUCATION COMMITTEE

## ASSEMBLY SCIENCE, INNOVATION, AND TECHNOLOGY COMMITTEE

*“The Committees will meet to hear testimony from invited guests regarding the importance of science, technology, engineering, and mathematics (STEM) education for students in kindergarten through grade 12, and particularly the ways in which female and minority students are being reached through STEM programs both inside and outside of school”*

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**LOCATION:** The College of New Jersey  
Ewing Township, New Jersey

**DATE:** March 21, 2019  
10:00 a.m.

### **MEMBERS OF COMMITTEES PRESENT:**

Assemblywoman Pamela R. Lampitt, Chair  
Assemblyman Andrew Zwicker, Chair  
Assemblywoman Mila M. Jasey, Co-Chair  
Assemblyman James J. Kennedy, Co-Chair  
Assemblyman Daniel R. Benson  
Assemblywoman Patricia Egan Jones  
Assemblywoman Gabriela M. Mosquera  
Assemblywoman Britnee N. Timberlake  
Assemblywoman Serena DiMaso



### **ALSO PRESENT:**

Erin M. Basiak  
Kathleen Fazzari  
Tara M. Howley  
*Office of Legislative Services  
Committee Aides*

Jade Bechelli  
Catherine Tung  
*Assembly Majority  
Committee Aides*

Joe Glover  
*Assembly Republican  
Committee Aide*

***Meeting Recorded and Transcribed by  
The Office of Legislative Services, Public Information Office,  
Hearing Unit, State House Annex, PO 068, Trenton, New Jersey***

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PAMELA R. LAMPITT  
Chair

VILA M. JASEY  
Vice-Chair

RALPH R. CAPUTO  
JOE DANIELSEN  
GARY S. SCHAER  
BRITNEE N. TIMBERLAKE  
ANDREW ZWICKER  
SERENA DIMASO  
HOLLY T. SCHEPISI  
EDWARD H. THOMSON  
DAVID W. WOLFE

ERIN M. BASIAK  
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**New Jersey State Legislature**  
**ASSEMBLY EDUCATION COMMITTEE**  
STATE HOUSE ANNEX  
PO BOX 068  
TRENTON NJ 08625-0068

**COMMITTEE NOTICE**

**TO: MEMBERS OF THE ASSEMBLY EDUCATION COMMITTEE**  
**FROM: ASSEMBLYWOMAN PAMELA R. LAMPITT, CHAIRWOMAN**  
**SUBJECT: COMMITTEE MEETING - MARCH 21, 2019**

*The public may address comments and questions to Erin M. Basiak, Kathleen Fazzari, Committee Aides, or make bill status and scheduling inquiries to Larkin Cugnitti, Secretary, at (609)847-3850, fax (609)984-9808, or e-mail: OLSAideAED@njleg.org. Written and electronic comments, questions and testimony submitted to the committee by the public, as well as recordings and transcripts, if any, of oral testimony, are government records and will be available to the public upon request.*

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**The Assembly Education Committee will meet on Thursday, March 21, 2019 at 10:00 AM at The College of New Jersey, STEM Building, 2000 Pennington Road, Ewing Township, New Jersey 08618.**

**The Assembly Education Committee and the Assembly Science, Innovation and Technology Committee will meet jointly to hear testimony from invited guests regarding the importance of science, technology, engineering, and mathematics (STEM) education for students in kindergarten through grade 12, and particularly the ways in which female and minority students are being reached through STEM programs both inside and outside of school.**

Issued 3/13/19

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ANDREW ZWICKER  
Chairman

JAMES J. KENNEDY  
Vice-Chairman

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## New Jersey State Legislature

### ASSEMBLY SCIENCE, INNOVATION AND TECHNOLOGY COMMITTEE

STATE HOUSE ANNEX

PO BOX 068

TRENTON NJ 08625-0068

#### COMMITTEE NOTICE

TO: MEMBERS OF THE ASSEMBLY SCIENCE, INNOVATION AND TECHNOLOGY COMMITTEE

FROM: ASSEMBLYMAN ANDREW ZWICKER, CHAIRMAN

SUBJECT: COMMITTEE MEETING - MARCH 21, 2019

*The public may address comments and questions to Tara Howley, Committee Aide, or make bill status and scheduling inquiries to Kimberly Johnson, Secretary, at (609)847-3840, fax (609)292-0561, or e-mail: OLSAideAST@njleg.org. Written and electronic comments, questions and testimony submitted to the committee by the public, as well as recordings and transcripts, if any, of oral testimony, are government records and will be available to the public upon request.*

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**ASSEMBLYMAN ANDREW ZWICKER (Chair):** I think we're ready to get started.

Thank you everybody for coming out.

We have to do roll call. (laughter)

Thank you.

I meant to say, thank you everyone for coming out; and can we do roll call? (laughter)

**ASSEMBLYWOMAN PAMELA R. LAMPITT (Chair):**  
There you go.

MS. BASIAK (Committee Aide): For the Assembly Education Committee; Assemblywoman DiMaso.

ASSEMBLYWOMAN DiMASO: Here.

MS. BASIAK: Assemblywoman Jones.

ASSEMBLYWOMAN JONES: Here.

MS. BASIAK: Assemblyman Zwicker, who is here for both Committees.

ASSEMBLYMAN ZWICKER: Here.

MS. BASIAK: Assemblywoman Lampitt.

ASSEMBLYWOMAN LAMPITT: Here.

MS. BASIAK: And for the Assembly Science, Innovation, and Technology Committee; Assemblyman Benson.

ASSEMBLYMAN BENSON: Present.

MS. BASIAK: Assemblyman Kennedy.

**ASSEMBLYMAN JAMES J. KENNEDY (Vice Chair):** Here.

ASSEMBLYWOMAN LAMPITT: And we have two members still coming.

ASSEMBLYMAN ZWICKER: So thank you everybody for coming out to the College of New Jersey for this hearing.

Before we get started, we have the President of The College of New Jersey, Dr. Kate Foster, here, who was kind enough to come over to greet us.

So the floor is yours.

**KATHRYN A. FOSTER, Ph.D.:** Thank you.

Thank you, Chair Zwicker; thank you, Chair Lampitt; thank you members of the General Assembly, the Committees on Education and also Science, Innovation, and Technology.

I'm Kate Foster; I'm the President of The College of New Jersey. I'm about nine months into my job, learning this campus and learning the people of it, just as much as you are.

This building you'll hear about in a moment from Dean Steven Schreiner, who is the Dean of the School of Engineering.

But I want to say a couple of things first.

One is that it's Spring Break. So as you're looking around, saying, "Where is everyone?" -- normally, it is not this way. It isn't that people are hiding in their residence halls or hiding in a classroom. There's no one around; it's Thursday of Spring Break so that's why no one is here.

Nonetheless, we are absolutely delighted to have you on campus today. This would normally be a classroom building here.

I wanted to say a couple of words just about the commitment that I have, that the College has to something you're talking about today. And it is not a cause-and-effect; it's not because you're talking about it that

we care about it. It's that we've been on this for a while now, and I hope to accelerate it and really, really enhance it.

And that's what we call the *diversification of the pipelines* into the different fields.

Now, you could look at education, for example, or nursing, and say the way we need to diversify is to get more men into nursing, more men into education. Or you could say we need more people of color in those fields. In this case, when we're really talking about science, innovation, technology -- the STEM fields and the STEM building here -- we're talking about having women into the fields and having people of color into the fields. And that's a very important part of what we've done.

I shared, earlier this morning, with Chair Zwicker, some of the data that we have for the College of New Jersey. We can be very proud, in many ways, on getting more women into the STEM fields. We still have work to do to get people from underrepresented populations, and races, and ethnicity into the STEM fields, or to remain in them.

So we have work to do. We know what that work is; we're absolutely committed to that work. It's one of the most important things, and contributions, we can do; and one of the most important contributions we think we can make to the State of New Jersey, and to society, and to the professions, by having those professions represent, much more clearly, the world as a whole.

So we're on it, and we care a great a deal about it, absolutely. As I said, we're delighted to have you here.

I wanted to give a moment or two to Dean Steven Schreiner; he's our Dean of the School of Engineering. This is, I would say, "his building," but it's really all of ours building.

But Dean Schreiner, do you want to share a little bit about the space that people are in now?

**STEVEN SCHREINER, Ph.D.:** (off mike) Certainly.

Thank you, Dr. Foster.

So welcome, everybody; I echo Dr. Foster's welcome to you.

So I am the Dean of Engineering, and I do share this building with the Dean of Science. We have Computer Science here; in fact, the Chair of the Department, Dr. Pulimood, is here this morning.

DR. FOSTER: Oh, hello.

DR. SCHREINER: And so we have Engineering and Computer Science here; and it's well-connected, actually, to the entire *STEM complex*, we're calling it. So all the Sciences and Engineering have distinct pathways that we can get to each other very quickly; and collaboration is what it's all about. So we want strong collaborations with faculty and students.

The entire building is designed for that; and hopefully you'll get a chance to walk around, in a break or something, just to take a look. We do have some students here working; Engineering students do work hard, so they're working on their projects during break. And you'll see the glassiness of the building -- the ability to interact amongst each other, even across rooms; it's just a beautiful setting. So I encourage you to do that.

The School of Engineering has, of course, strong Engineering programs. We have six of them: Biomedical, Civil, Computer, Electrical, Mechanical, and an Engineering Science program. We also are very proud

of our history of education. So we have -- our roots are in an Education Department; actually, Industrial Arts is where we were born out of. We still have a very strong Education Department in the School of Engineering: the Interpretive STEM Education Department. We have about 160 Elementary and Secondary Ed students coming through that program at any given time.

Beyond that, we also have the STEM Education Center -- which does thousands of hours of professional development for teachers across the state and beyond -- for all things STEM, and learning about the design process and how to incorporate that into the schools.

And, of course, we work directly with many school districts across the state.

So we're very proud of our long-storied history with K through 12, and where it's brought us to today.

So that's basically what I wanted to say about the building. But again, please feel free to walk around, see the different things. There are many facilities here that are wonderful. It was paid for, in part, by the New Jersey Building Our Future Bond, so we're very, very pleased to have received that help in this building support.

I will mention -- we do have a second Engineering building that's under renovation right now. So STEM is a little crowded; if you see a few boxes, that's because we are, sort of, crowded in here. But that's normally-- When we get back next January, we'll have much more space in both buildings.

Thank you.

ASSEMBLYMAN ZWICKER: Thank you so much.

Thank you for--

DR. FOSTER: And I was glad that Dean Schreiner mentioned that this building was paid for, in large measure, by the State of New Jersey and the taxpayers.

ASSEMBLYMAN ZWICKER: You're welcome. (laughter)

DR. FOSTER: I would have been remiss to not say that.

Have a great, great hearing; and really, good luck today.

ASSEMBLYMAN ZWICKER: Thank you; thank you for having us here.

ASSEMBLYWOMAN LAMPITT: Thank you all very much.

Well, good morning, everybody.

I am Assemblywoman Pam Lampitt, and I Chair the Education Committee. And it's a wonderful opportunity when two Committees can combine to look at an initiative within the state.

My son went to The College of New Jersey; so I am very pleased to be back on the campus.

I told Dr. Foster before that, unfortunately, he probably majored in soccer (laughter); but really, he majored in Health and Exercise Science. And I am very proud of him because, as Dr. Foster just mentioned, men in the nursing field -- to be able to start moving the needle on that. He is a trauma ICU nurse at Cooper Hospital; so, certainly, his science education here really propelled him to go and get a second bachelor's degree -- that's okay; he's doing quite well now.

But certainly, the opportunity to be here and to talk about STEM education-- So some of you may know I work at a university as well; it's really interesting, because we're the co-Ivies here; I'm Penn, he's

Princeton. And certainly, STEM education -- on our college campuses, as well as this college campus, and all throughout the country -- is an initiative that I believe we all need to undertake.

However, it needs to really, truly be something that we're fostering in the K through 12 system. We really need to be fostering it and supporting it; trying to get our young people really motivated, and to support them in their own initiative in the science field.

I myself have been very much a proponent of equal pay for equal work; and certainly, the law passed this year. And knowing that many women who go into these fields are significantly underpaid -- this is another, sort of, aspect of educating our young women as to their value that they bring into the STEM field.

Certainly, seeing the movie *Hidden Figures* was something that I think really helped to open the eyes for many young women -- many young women who are from a cross-cultural (*sic*) society -- to see that there are opportunities; and they made significant strides, many years ago, and were innovative to help launch us to where we are today.

There are so many aspects, so many areas for STEM, and the involvement of STEM, where people can utilize their talents. I think that that's something else that we need to be looking at -- where are the career opportunities -- and really trying to focus about your industry -- okay? -- your career industry, and how are we doing in education, okay? We really need to be better partners. I'm getting good nods of heads; I like that. (laughter) We really need to be better partners in all of this, so that what we are doing in the Legislature in supporting education -- K through 12, higher education -- is really marrying and what you need in the workforce.

Our goal is to develop a very strong workforce here in New Jersey, because we want to continue to attract businesses here in New Jersey. I'm originally from the Boston area, so everybody knows the 128 Corridor; you know, we want to be the 295/95 Corridor here in the State of New Jersey, up and down the state; so that we are not just looking at one small, condensed area, but certainly showing opportunities throughout our great state.

I'm very pleased to be here with Assemblyman Zwicker and this wonderful dynamic group of legislators who really are very passionate about this particular issue. Certainly, we come from North and South; we come from different communities. But really, we come together on a common goal -- to try and hear from you, "What are the opportunities for us to be able to work on, on a collaborative basis?"

So thank you very much for coming today.

ASSEMBLYMAN ZWICKER: Thank you, Chairwoman Lampitt.

And it really is a pleasure to be here. I'm fortunate enough to serve on both the Education and the Science Committee; and this is a topic that is really near and dear to my heart.

I just want to preface my comments first by giving a particular thanks to Assemblyman Benson for joining us today; he's subbing in on the Science Committee. And to Assemblywoman Egan Jones, who has been subbing on both Science and on Education.

Assemblywoman Egan Jones, I just want to point out that-- Some of you may not know this, but she recently announced that she was

going to retire at the end of this session after a long and distinguished career in public service.

Many people have already commented on the fact that it is a great loss to the Legislature. I want to go somewhere else; I want to point out -- several people have pointed out to me -- that you made your announcement the day after subbing in on a particularly long Science Committee. (laughter)

ASSEMBLYWOMAN JONES: Indeed I did.

ASSEMBLYMAN ZWICKER: Right? And so I am taking some of the heat for your announcement; I just want to put that into the record.

ASSEMBLYWOMAN JONES: No need to; 45 years-- And I am not retiring; only not running again for this seat, that's all.

ASSEMBLYMAN ZWICKER: But I do want to say, as many others have said--

ASSEMBLYWOMAN JONES: Thank you.

ASSEMBLYMAN ZWICKER: --thank you for everything that you have done on behalf of the people of New Jersey.

ASSEMBLYWOMAN JONES: Thank you very much.

I fooled a lot of folks, that's all. (laughter)

ASSEMBLYMAN ZWICKER: I'm also-- If you didn't know, today is World Poetry Day. And so, not just the second day of spring, but it's World Poetry Day. And while we're talking about STEM, I'll often -- you know it's an acronym for science, technology, engineering, and mathematics -- many times, we'll also talk about it in terms of *STEAM*, where the *A* represents the Arts. And while we are going to focus today on

what we can do, collaboratively, when it comes to -- as Chairwoman Lampitt said -- really making New Jersey a model in the country for the strongest, most highest quality, diverse workforce when it comes to STEM or STEAM, a part of it has to be, always, the importance of the Arts and a Liberal Arts education.

I've spent 20 years working on science, and education, and helping to train the next generation of scientists, engineers, mathematicians, physicians, and everything else that goes under the umbrella of STEM. I'm fortunate enough that actually a couple of my colleagues are here today, to talk about some of the work that's happening at Princeton.

I wanted to give, if I might, just a moment, a quick story for why I'm here; because I think it represents a bit of what we're trying to do.

I'm here because of a young woman named Shaefona Duette, who graduated from Trenton Central High School many years ago. So this is one of the first people I ever met. She entered into a high school internship program to identify a diverse group of young people -- even before they got to college -- but to go ahead and come to Princeton, in this case, and do a summer research program.

I helped change her life; she was changing mine -- I just didn't know it at the time.

But from there, I've spent all this time figuring out, "What can we do; how can we work together to go ahead and do this strong ecosystem that we're going to hear so much about?"

So I am very much excited to -- looking forward to hearing. We have people from the public sector, the private sector, industry, all talking about this ecosystem and what we can do together.

The last thing I'll say before we start with the testimony -- we are transcribing everything here, so everything will be entered into the record. If you have handouts, please-- If you don't have enough for all of us, make sure you at least just bring them up to the front to one of the aides, and we'll make sure those go into the record.

And we have a lot of people; so we are asking that you keep your comments to five minutes or less.

And with that, I think we are ready to begin.

And so we're going to start with Shannon Greco, Science Education Senior Program Associate from the Princeton Plasma Physics Laboratory.

**S H A N N O N   S W I L L E Y   G R E C O:** Chairwoman Lampitt, Chairman Zwicker, thank you so much for allowing me to talk a little bit about what's -- an issue that's so important to me personally, but also to the State of New Jersey.

Today you're going to hear from some of the most successful agents of change in STEM education in New Jersey. But how do we know that they're successful? So I'll leave it to them to talk about their particular measures of success in their particular programs; but I can tell you what research shows is effective in developing and diversifying the STEM pipeline to strengthen the New Jersey innovation workforce.

My name is Shannon Swilley Greco; I am the Senior Program Associate at the Princeton Plasma Physics Lab in the Science Education Department. And I've studied the effectiveness of STEM education programs at the PPPL, and also at Princeton University, for more than 15 years. We definitely need these programs.

A report recently found that if we trained scientists and engineers at the current rate, we're going to be short a million jobs over the next 10 years in the U.S. Another report showed that women could fill half of all the jobs in the country, but less than a quarter of the jobs in STEM. It's worse in engineering; women get 20 percent of the undergrad degrees in engineering, but only 13 percent of the engineering workforce is female. And underrepresented minorities pull even fewer of these jobs.

So where are we going to get these million workers? Well, some of those stats might give you a big hint of where those could come from. In particular, females -- they make up 47 percent of the population of those getting physics degrees -- and I focus a lot on the physics stats, because that's the area that we're working on -- but those statistics are equally bad in all of STEM. But 47 percent of those taking high school physics are women. Black and Hispanic -- it's more like 27 to 29 percent. Then it drops, hugely, to 21 percent of the physics bachelor's degrees go to women; Hispanics earn 7 percent of those bachelor degrees, and African Americans get 3 percent of those degrees in physics.

And it keeps dropping from there, as you go up in levels.

And like I said, this data is for physics; but it's -- the underrepresentation is profound across all STEM fields.

So I study the *stickiness* of, in particular, undergraduate research experiences -- also high school internships that we have at the Princeton Plasma Physics Lab -- and what happens to them after they spend a summer or more with us. We have programs like this at PPPL, but I've also run some at Princeton University.

The answer is, it is sticky; they stay in this field. We know this because we see, in our particular program, 92 percent of our former interns go on to graduate school. In the case of physics research -- that's appropriate to get a Ph.D.; and not all STEM jobs require a Ph.D., and sometimes is not the best route, but in physics research, it is a great way -- 81 percent of our interns go into the workforce, which actually many programs like this don't actually study.

But for all these programs across the country, similar programs in REU -- funded by the NSF and DOE, etc. -- the rates are about 50 to 70 percent go on to grad school. But the gains are even more pronounced for underrepresented minorities.

The key is, how do you get them there? We know that we can keep them once they've gone through our program; but where do we get them from? So I think that there's some -- there's a lot of research into where does this early interest come from in STEM fields. In particular, my favorite science education paper, by Robert Tai, is called "Eyeballs in the Fridge," and he studied where this early interest comes from. And the title comes from one girl who dissected cows' eyes in her science class, and her teacher offered that, "You could take them home, the extras, if you wanted." So she put them in her brown paper lunch bag and put them in the fridge. And later that evening, her mother was shrieking; and she knew STEM was for her. (laughter)

But what the paper says, overall, is that 65 percent of STEM professionals got their early interest in middle school and high school; that K through 12 period is key.

Actually, other studies say that women, in particular -- 75 percent of them get their interest -- so even more find their interest in middle school and high school; and actually the males cite, often, a-- The majority of the males cite the interest came from an intrinsic interest; it came from within them. But the females said that it was an education experience that sparked their interest in STEM. So that's where it's coming from, and we can provide that.

So imagine if we provide more of these exciting, quality STEM education experiences in middle and high school -- that's where those million jobs are going to come from. That's how we start to fill that innovation workforce gap.

But it may be one interest that sparks an interest; but it takes countless experiences -- it's a cumulative effect of all these episodic exposures, so one negative experience can completely derail somebody. But if you have all of these positive experiences behind you, all of those deposits in your bank of positive STEM experiences, that can inoculate you against these difficult encounters you might have along your path.

Speaking of path -- I actually like the term *pathways* instead of *pipeline*, because I don't think it's one tube that you put people in, and they pop out the other end. I think it's a meandering thing, and there are lots of ways in and out. In my own experience, I love STEM fields; I was so great in math and so great in chemistry; was so excited about it, and I wanted to be a chemical engineer. But I lived overseas; and I came back to the U.S. for college, and someone told me, "Oh, you'll never get to travel if you're in a STEM field. You'll spend your whole time in the lab, and you won't get

to talk to anybody.” And I really like to talk to people; I’m a very social person.

So the STEM major told me this -- gave me misinformation, basically, about what it’s like to be a STEM professional. So I dropped the major, and I changed to International Studies, just because I wanted to travel.

So then I graduated college; and I started crashing on my mom’s couch while in between trips, and temping at Princeton to fund my travel. And I started temping for someone at the Princeton Center for Complex Materials, Dan Steinberg -- who is the Director of Education Outreach at the Princeton Center for Complex Materials -- and he saw my potential and my love of STEM. And he said, “Okay, I know you want to go to Africa and preserve national languages in Africa -- or whatever you want to do -- but we could really use your help in STEM education here in the U.S.” So he fostered my love of this field; he mentored me. And here I am, right back on this path related to STEM.

So even though I slipped off the path, slipped out of the pipeline -- whatever -- I wandered back to it.

So these programs can help young people find the path and guide them along that path.

ASSEMBLYMAN ZWICKER: Thank you.

MS. GRECO: Thank you very much for your time.

ASSEMBLYMAN ZWICKER: Sure.

ASSEMBLYWOMAN LAMPITT: Thank you.

ASSEMBLYMAN ZWICKER: Questions?

MS. GRECO: Yes, please.

ASSEMBLYWOMAN DiMASO: I just have a statement.

What you said about one negative comment-- My daughter-in-law was a physics major. She fell in love with physics, because of her high school teacher. She became a physics major; and somebody gave her that same, "You're never going to get a job," and she left it, and she's in marketing.

And you can see, she's really naturally happy; but that's what she's doing now.

MS. GRECO: Well, I hope she finds somebody to put her back on that path.

ASSEMBLYWOMAN DiMASO: I'm going-- Your story is giving me inspiration to call her.

MS. GRECO: Oh, I hope so.

ASSEMBLYWOMAN DiMASO: If I could do it right now, I would. (laughter)

MS. GRECO: I don't mind; go ahead.

ASSEMBLYWOMAN DiMASO: But I will wait until later.

Thank you.

Thank you, Chairman.

ASSEMBLYWOMAN LAMPITT: So can you give us one example, one program that you're currently doing that has inspired young women to go into STEM?

MS. GRECO: Absolutely.

Actually--

ASSEMBLYMAN ZWICKER: And before you answer that--

MS. GRECO: Yes.

ASSEMBLYMAN ZWICKER: --could I just say several people have reported the acoustics in the room--

ASSEMBLYWOMAN LAMPITT: Right; are hard to hear.

ASSEMBLYMAN ZWICKER: --are hard to hear, with the air conditioner and everything else.

ASSEMBLYWOMAN LAMPITT: So speak up.

MS. GRECO: Okay.

ASSEMBLYMAN ZWICKER: So we're not amplified, unlike when we're at the State House. So we're all going to try to, just, speak up so everybody can hear us.

MS. GRECO: Okay, sure.

So we have so many different programs. We have an entire suite that addresses -- from middle school, to high school, and all the way up.

Deedee Ortiz will actually tell you all about our Young Women's Conference, in particular; the target audience for that is grades 7 through 10; so she'll give you a lot of details. I actually evaluate the effectiveness of that program, and show -- we have a measured increase in attitude improvement of attitudes towards science and scientists; and it develops the students' identity as a scientist. And these kinds of experiences are key to that.

We also have the high school internship that I administer. So we bring in students in their senior year to spend a research experience with a scientist or engineer. And we're actually very excited about the State's pre-apprenticeship program; so maybe we'll get into that too.

We also do a lot of engaging, one-day activities, a lot of school visits; and we try to partner with other longer-term programs so that-- You know, maybe the Liberty Science Center is doing a week-long STEM camp, and then part of that will work with us, and they'll spend a day with us, and we'll do some engineering and science programs for them.

ASSEMBLYWOMAN LAMPITT: Thank you.

MS. GRECO: Thank you.

ASSEMBLYWOMAN LAMPITT: Assemblywoman.

**ASSEMBLYWOMAN MILA M. JASEY (Co-Chair):** I'll just make the comment that this is very exciting.

MS. GRECO: Isn't it?

ASSEMBLYWOMAN JASEY: I happen to have a daughter who loved science and math all the way through high school, and was discouraged in college. But taught -- became a teacher, and taught math; and loves it.

So she's back on the path; but this is what we need to hear about, and what we will certainly support.

MS. GRECO: The career awareness -- nobody told me I could work at CERN, you know; I could have been there. I can still work at ITER, maybe. (laughter)

ASSEMBLYWOMAN JASEY: Yes, yes.

MS. GRECO: Thank you so much.

ASSEMBLYWOMAN LAMPITT: Thank you very much.

ASSEMBLYMAN ZWICKER: Thank you so much.

ASSEMBLYWOMAN LAMPITT: Next we're going to have Kamana Misra, Association for Women in Science.

And speak loudly so people behind you can hear.

**K A M A N A M I S R A, Ph.D.:** Yes, a very good morning to everyone.

Can you hear me? Because I just saw how the acoustics were working.

So I'm going to be very brief.

My name is Kamana Misra; I'm the President for the Association for Women in Science, the New Jersey Chapter.

And unlike the previous speaker, we have to self-fund the activities that we do; we don't have a huge resource of Federal or State money to help us. And I think one of the ways such programs can benefit organizations -- we have to see how we can partner with the State to promote the various programs that we offer.

I'm a neuroscientist by training; and through my career, through the Ph.D. school as a scientist, as a researcher, and currently trying to be a STEM entrepreneur, I've had many personal experiences which help me guide and, sort of, synergize with the mission that AWIS, Association for Women in Science, has.

I'll briefly talk about AWIS; it's a huge organization which has a national presence. At the national level, we talk about advocacy and policy changes that help promote our vision of getting women in STEM and retaining women in STEM.

But at the State level, what we try to do is work out effective programs -- that we can work at a smaller level -- and really reach out to people who benefit through this. So at the New Jersey level, we have at least four broad categories of programs, where we are trying to address

women in STEM at different stages of their career. One of them is the STEM scholarship that we have been giving for more than 20 years now; and this is targeting the students at the high school level. We try to give it to -- we were giving it for many years to high school seniors, so that it helps them in making career choices to go towards a STEM career in college.

But beyond that, we also try to do many programs for women in the STEM workforce, once they have graduated from school and colleges, and try to maintain themselves there.

So there are two kinds of programs for women who are professionally already in the STEM fields. One is the mentoring awards that we have initiated; and this is to encourage participation and interaction of various women STEM leaders to help each other. One of the main issues that we see -- not only for women in STEM, but for any other career -- is that you need someone to look up to, and someone to pull you up through the nuances of a STEM career. So we feel mentoring is a very important aspect, not only of STEM, but other parts of life; so we want to award people who do this and, sort of, promote the thing. So that is another program that we are working on.

Finally, we have started an innovation kind of a system where we are trying to help women who are in advanced stages of their career; and also schoolchildren specifically. All our programs, of course, are catering to women in STEM.

So we recently, like two years ago, started an entrepreneurship challenge, where we are trying to promote females to come up with ideas on how to start STEM-focused companies within New Jersey. And we have partnered with various internal associations, organizations, and academic

universities, to help them leverage the resources that New Jersey has and make a career out of this.

And at a lower level, we also -- that challenge is also designed for high school girls. In that case, we are not talking to or teaching them about starting companies, but more about thinking about innovative ideas, which could lead to potential ideas for starting the companies. In the last two years, I'm very proud to say we have -- the last year we graduated six women entrepreneurs who came through our program. We partnered with NSF, who gave us some money to partner with NJIT to take these females, who do not need any association-- So one of the problems I feel is that most of the programs are focused on certain institutional associations. You have to be part of PCN, and you have to part of Rutgers, you have to part of some institution to access that. But what happens to people who are not part of any of these? So we are trying to, sort of, make a system where anyone who has an interest, has the background, and wants to do something about it -- there's a network within the state to go through that. And we are happy to partner with the academic organizations or with the rich pharma and local biotech sort of companies we have here.

So the females not only got awards through this program; we also offered them training opportunities through the Summer Accelerator at NJIT. And then, later on, in synergy with Johnson & Johnson and Bristol-Myers Squibb, we have developed programs where the entrepreneurs get to go there and, sort of, deal with the marketing people who have seen -- you know, making companies from a different side. So that is another program that we are working on.

But what our research -- AWIS has a lot of research, policy research which supports the programs that we, sort of, try to provide to people. One of the things that we see is that the retention of women or even, you know, attraction into the STEM field, is because of (*sic*) an implicit bias that exists in all our minds. Even I, sitting here, might have some -- something in me, which I don't realize; and so, you know, girls do not do math because they are girls; not because they are not interested.

So what our many years of research is suggesting is that women have to be part, an equal part, of whatever programs are being initiated. If there is no female representation, you will not see any move towards getting effective changes in those things.

For instance -- and I will finish with that -- AWIS, at the national level, conducted one of the largest studies, which involved the U.S. and other marketing countries, because it was done in synergy with a publishing company. And what that research asked them was about the STEM-life science balance and various other questions. And it also addressed the awarding that goes on within the scientific field -- awards that are given.

As we all know, the majority of the awards go to males, versus the females. So AWIS did this report, and then tried to work with all these professional organizations to promote women; uplifting the number of women who are getting awards. So as long as AWIS was working with them for one or two years, and sort of insisting, the number of awards for females increased. But the minute we let it go, it went back. Meaning, the implicit bias is always there, it will be there, and it has to be addressed by involving females in all processes.

And, you know, I always think -- I have shared with some of your colleagues here -- California is one of the first states which has now made it mandatory that all companies, which exist in California, should have 50 percent female board representation. I hope New Jersey can do that also.

ASSEMBLYWOMAN DiMASO: That will be a challenge.  
(laughter)

DR. MISRA: So that is it.

I thank you so much.

ASSEMBLYMAN ZWICKER: Everyone is taking notes.

DR. MISRA: And I am happy to answer any questions.

ASSEMBLYMAN ZWICKER: Thank you.

ASSEMBLYWOMAN LAMPITT: Thank you.

ASSEMBLYMAN ZWICKER: Questions?

ASSEMBLYWOMAN LAMPITT: Any questions?

Assemblywoman.

ASSEMBLYWOMAN JASEY: What's your greatest challenge -- numbers, finances? Because the programs that you're talking about are obviously important and crucial.

DR. MISRA: Finances is, you know, a big part, but not the biggest part, I would say. Because, thankfully we have a very good ecosystem which can -- if you sort of get after them -- you end up with some money.

It's the network and the resources; a place where you can reach out to every STEM New Jersey woman. That doesn't happen; everyone is very fragmented.

You know, we have many partners here, like STEM Pathways Network, and we have people from-- We know each other; we are working; but there are so many who are disconnected. And so if-- This year we sort of re-announced our entrepreneurship challenge. All we need is a woman-owned business in New Jersey for two years; or you have an idea. The number of applications -- it seems like there are no women who want to start businesses. But that's not true; it's just that we cannot reach them.

So we have money; we don't-- We are ready to give it to you; we are ready to train you, but we don't see people.

So I think the disconnect is the biggest problem.

ASSEMBLYMAN ZWICKER: Thank you so much.

DR. MISRA: Thank you.

ASSEMBLYMAN ZWICKER: So now we have a panel coming up to talk about ecosystems, from Delran STEM Pathways.

Erica DeMichele, Mary Jo Hutchinson, Brian Brotschul, and Kim Case.

**ERICA DeMICHELE:** Just so everybody knows, this is a Flash Talk. It literally will be five minutes, and it's going to be very visual.

So Assembly people, if you want to look at us, or the screens--

ASSEMBLYMAN ZWICKER: Which way should we look?

MS. DeMICHELE: We are like auctioneers selling this to you, okay? (laughter) So just be prepared.

Go.

**BRIAN BROTSCHUL, Ed.D.:** Good morning.

My name is Dr. Brian Brotschul, and I am the Superintendent of Schools in Delran Township.

We come from Burlington County. The Delran Township Board of Education serves 3,000 students over four schools. We are ethnically diverse, and we are focused very much in the area of STEM.

Much of our work in Delran has been with great gratitude to the functioning and the execution of the School Funding Reform Act of 2008, in addition to Senate Bill 2. We have been allowed to return and to provide our classrooms with the funding, and to provide the absolute frontline workers and frontline students with great funding and amazing resources in the area of STEM.

**MARY JO HUTCHINSON:** As we know, data shows that underrepresented populations are not making headway in STEM careers. Women have made no gains, and minorities have actually lost ground. Compared to 2001, these groups are simply not keeping pace with the jobs that are out there.

**MS. DeMICHELE:** In 2016, the Delran STEM Ecosystem Alliance became one of four New Jersey ecosystems; and in 2017, we were accepted into the National Community of STEM Learning Ecosystems, as one of 68 internationally recognized groups, focusing on networking and partnerships, to create a strong STEM workforce.

**MS. HUTCHINSON:** A collaboration of K-12, higher education, business and industry, and community partners working together, -- our mantra is, "STEM for all" -- with a focus on underrepresented population -- to develop skills and future innovators who will contribute to the economy of New Jersey.

**MS. DeMICHELE:** The Cradle-to-Career pathway is the visual representation for STEM Readiness. A 2017 report from Microsoft

indicates that girls lose interest in STEM subjects by age 15. So we must spark STEM interest, in identities, before high school.

Once there, dual credit and certifications with RCBC -- our local associate's degree program -- prepares students for college and career.

MS. HUTCHINSON: Our current capital project is a Fab Lab. In this space, we'll promote real world problem-solving, using digital tools; and students will develop, design, create, and hone skills that will translate into their careers.

MS. DeMICHELE: Programs like Lockheed Martin's Women in Engineering Day and Teen Tech Workshops encourage our young women to develop a STEM culture and see themselves as *STEMinists*, like us. (laughter)

ASSEMBLYWOMAN JASEY: *STEMinists*; I like that.

ASSEMBLYWOMAN LAMPITT: I love that.

MS. DeMICHELE: Thank you.

MS. HUTCHINSON: Delran STEM has leveraged grant funding to provide high-quality experiences for students who could not afford them otherwise. With scholarships of up to 75 percent off of the tuition, or on free and reduced lunch, longer hours, and free busing, we have removed barriers to participation.

MS. DeMICHELE: For students with disabilities, a special education integrationist makes modifications to our STEAM camp programs. Teacher grants are fulfilled -- teacher requests for reading materials at differentiated levels, which allow access to the same science content as their peers.

MS. HUTCHINSON: Special ELL family engagement nights, complete with translated materials, in-person translators, and ethnic foods, resulted in high attendance and enthusiastic responses from families. This really implores us to continue pursuing STEM for all in our mission.

MS. DeMICHELE: Listening to our parents, and using that data in our evaluations from families, allows us to move STEM programming forward; and we continually surveyed our families on STEM dispositions and attitudes, then analyzed the results to measure our impact and improve our future programming.

MS. HUTCHINSON: A strong homeschool partnership is highly beneficial to a child's education. Sharing resources and research with families increases their capacity to build STEM interest and proficiency in their children, and to support and extend the same experiences their children have at school.

MS. DeMICHELE: Lockheed Martin is one of our most supportive STEM champions, including \$8,400 worth of grants, which were awarded to our teachers this year. These grants support innovative teacher-designed STEM classroom projects that have impacted 550 students this year alone.

MS. HUTCHINSON: Delran Schools is proud of a comprehensive K-12 robotics program, which increases in complexity as our students progress; from simple Lego robots at the K-2 level, all the way up to designing, building, and programming robots for regional high school VEX Robotics competitions.

MS. DeMICHELE: Our community partners, Sustainable Delran, and our four bronze-level certified schools, won the prestigious

Collaboration Award at the NJSBA Conference in 2017. And as a result, we've been asked by Kean University to present in China this May, offering our expertise on integrating STEM learning for students there.

**K A Y C A S E, Esq.:** So my organization, the Research and Development Council of New Jersey, manages the New Jersey STEM Pathways Network and our four STEM Learning Ecosystems.

As you have seen, Delran has had great success, and so have our other ecosystems, which have hosted Hackathons, bilingual Family Nights, and partnerships with companies, like Siemens, to train teachers in CAD -- computer aided design.

And our ecosystems are part of the International Network, and have been recognized by the Office of Science and Technology Policy as a “best practice” for the country.

We also can't know the impact of our ecosystems, or our STEM programs, without knowing baseline data; and the NJSPN is proud to have launched the New Jersey STEM Data Dashboard, which is hosted on the *njstempathways.org* website, and provides data on STEM success indicators, including student performance, equity in student performance, and student participation.

I encourage everyone here to offer our services to your district STEM leaders, and have them join the STEM Pathways Network.

ASSEMBLYMAN ZWICKER: Thank you.

MS. DeMICHELE: That's five minutes. (laughter)

ASSEMBLYWOMAN LAMPITT: Wow.

ASSEMBLYMAN ZWICKER: And 10 seconds. (laughter)

I just want to say, for the record, that I was not just simply stuffing my face; that was for science.

I do have one question before opening it up to members of the panel.

And I had a chance to come, of course, and see the opening of what you're doing in getting more people in.

And it's a question -- it could be to you, Kim Case, or to all of you -- but what is it going to take to grow? As you show success, as you measure what's happening, what's it going to take to grow these ecosystems? Right now, you're at four, I think you said. What is it going to take to grow them to 8, or to 16, or to 32, etc.?

MS. CASE: Okay, so we have good models here in New Jersey; we are on the precipice of launching more. So I think it's about showcasing the model, and really showing people what the template is to create the cross-sector partnerships -- it's really an architecture of cross-sector partnerships -- and providing, sort of, the initial startup funding. So there needs to be some funding to it; and then move that process along by putting it under the leadership of the STEM Pathways Network.

Laura Overdeck is going to testify here; the Overdeck Family Foundation has been incredibly supportive, and has really driven this effort, over the last three years; with the R&D Council recently taking over the management.

So it does -- the funding does matter; but we do have a good model that we should showcase. And I'd be happy to talk to anybody, in anybody's district.

DR. BROTSCHUL: And speaking from the K-12 lens, there's been a high level of articulation between higher education, private industry, and public industry as well. In Delran Township, we have partnerships with Rowan College at Burlington County, Princeton University, Rider, TCNJ, and a host of other locally grown and locally developed businesses that are looking for a robust, diverse workforce that we are in the process of creating for them in Delran Township. And the Board of Education there is focused on creating and producing students for careers that don't even exist yet. We're producing problem-solvers, we're producing appliers; and we have a truly bona fide K to 12 approach in the area of STEM education, which is guiding all of our decisions from a goal setting perspective and from a budget setting perspective.

MS. DeMICHELE: And anecdotally, I mean, when we hear students, who are having opportunities as a result of the work we're doing, say to us, "I didn't realize that I wanted to go in the Navy to go into the nuclear engineering program. Now, I have to change my schedule next year and take physics." That's a proud moment.

Or to have a young woman in our Design Studio, this past week, as we're working through how community partnerships, business and industry are going to be the influx into that Fab Lab -- that digital Fab Lab that opens this fall -- when she said, "Now I know what I want to do. Had I not had this experience, I would not have found the passion that I find in working with you; and thank you."

We're going to have more data coming; and I think Delran is going -- you're going to see huge improvements in our -- a loss of absenteeism and higher scores, despite the fact we've had a 300 percent

increase in our bilingual education program in the past five years. We have a large Turkish and Portuguese population, which is unlike many other towns in our state. And yet we are still seeing great successes in the data; so the data will speak for itself.

ASSEMBLYMAN ZWICKER: Assemblyman Benson.

ASSEMBLYMAN BENSON: I was really impressed by everything here. The Turkish -- because my wife is Turkish -- I thought that was nice when I saw that. I'm glad to hear that's why it was up there.

The one thing we haven't, kind of, heard about STEM -- the importance of STEM for those who aren't going into STEM careers. And I know you understand how important that is; but I think it's important to be on the record. You know, I knew I wanted to have a STEM-based-- I was a Physics undergraduate, but I was pretty sure I wasn't going to do research; I wanted to go on and do policy and other things like that; so that's what I did.

I didn't know I could do that. And my advisor, my undergraduate physics advisor turned out to be the lobbyist for the American Physical Society, Dr. Frank Slakey. And so when I saw that there was something, instead of going to law school I went into Science Policy.

But the importance-- You know, we need more STEM students in journalism; we need more STEM students in policy and politics; we need more STEM students in business management. We need that all the way across the board. So there's not only just an appreciation, but just -- I think science literacy in the general public is so important; so that we don't have such a fight to explain about vaccinations, or climate change, or all these other things that are so important to not only just our basic safety -- let

alone success for our students. And I think that all comes back to opening STEM up, not just for those who want to go into the fields, but broadly for all students.

MS. HUTCHINSON: So in Delran STEM -- really the way to sum up our entire mission is, "STEM for all." And when we say *all*, we mean the underrepresented populations -- the minorities, the women. We also mean economically disadvantaged; we mean kids who aren't what we consider the academically elite, the kids who you think are going to take the AP courses.

But our learners -- we view learners not just as the students in our K-12 school districts; but as our entire community. And I think a lot of our family engagement and outreach events that we host are focused on increasing the STEM education opportunities, not just for our students, but for their parents, for their families, for the entire community.

We've recently, for New Jersey STEM Month, held several family engagement nights. And the activity was a Lego building challenge, where the parents and the students came together and had to create these challenges with each other. But as part of the night, we educated the parents; we taught them some -- almost sentence starters for how to talk to their children while they're engaging; how to let their children speak first. What if you can see their design is going completely wrong? Don't tell them; ask them some questions, but don't take it over.

In addition, we host an annual STEM Fair; our next one is coming up in May. And part of it is showcasing; about 50 percent of the things at the STEM Fair are student organizations, from K to 12, showcasing the work that they've done all year. The other half are what we

call *vendors* -- even though they're not necessarily selling something -- they're community, and business, and industry partners who are coming to showcase STEM in everyday life.

So we want our parents to walk away from the STEM Fair with, maybe, some tips on how they could do energy savings in their home; or how invasive species might hurt their garden; or whatever -- so that the STEM education isn't just the K to 12.

ASSEMBLYMAN BENSON: Because I-- One of my elementary schools does Rocket Day; they've been doing it for almost 40 years. It's wonderful; it's-- Literally, the elementary school -- it's three doors down from my house; I go to it every year. And when I speak to the parents, one of the things that I ask them -- I mention that I was a Physics undergraduate. I ask them just to ask -- if you could remember one thing when you go home, to talk to your kids about science. If for some reason they're not doing well in math or anything else, please erase from your memory-- Because so many times I've heard parents say this: "Oh, I wasn't good at math either," or, "Science wasn't my subject either." They're trying to be sympathetic, but they're actually ingraining a wrong path.

MS. DeMICHELE: Yes.

ASSEMBLYMAN BENSON: And the more we can teach parents that that's not the way to talk about science or math--

MS. HUTCHINSON: It's infectious.

ASSEMBLYMAN BENSON: In fact, failure is part of science, and talking about that is so important.

MS. DeMICHELE: So we say that; FAIL -- First Attempt In Learning.

And it's embedded in our culture, and it's part of the way that we, as administrators, coach our teachers up. We have a model -- an evaluation model that's very successful, that allows us to talk about growth, grit, determination, and failing being an important part of brain development. Your brain is not going to get any larger if it's fixed. So we have to fail in order to learn.

Edison found, what, 10,000 ways to not make a lightbulb? (laughter) So that's the mindset that we're trying. It's a culture-building opportunity. And we are passionate, as you can hear, about this for our 3,100 children in Delran; and hope that, through Kim's amazing administration of the New Jersey STEM Pathways Network, that these ecosystems can grow.

And we are always offering for people to come and see what we have going on in Delran; and we would love to have all of you, when our Fab Lab opens in the fall.

MS. CASE: Speaking of the Fab Lab opening -- one of the ideas that we have for a display in the Fab Lab-- So many places showcase the wonderful examples in trophy cases that, you know, you see sports teams earning. We would like to have a display area in our Fab Lab of failed attempts; because that sends the message that just because you tried something and it didn't work the first time, that's okay. We learned one way it didn't work; we're going to continue. So that's our goal; once we have a couple of projects coming out, to put some -- shine a spotlight on that.

ASSEMBLYMAN ZWICKER: That's a great idea.

ASSEMBLYWOMAN LAMPITT: That's wonderful.

ASSEMBLYMAN ZWICKER: Thank you so much, to all of you.

ALL: Thank you.

ASSEMBLYWOMAN LAMPITT: I think we have a few more questions.

ASSEMBLYWOMAN LAMPITT: So thank you very much.

And I hope that -- Assemblyman Zwicker said it earlier -- about STEAM, not just STEM.

So later on -- not right now -- but I would love to come to Delran and hear about the additional *A* in your STEAM, in the work that you're doing.

And quite interesting; I'm very struck by the fact -- about how you're approaching the supportive parenting. Because there was an amazing article in the *New York Times* this past weekend, about how parents are robbing their children of their adulthood. And no further do we need to talk about that issue -- about allowing our children to fail, and to understand failing is okay -- it's what you learn from it, and how do you take that and turn it into something that could be a positive sort of experience.

My big takeaway here is not only the great work that you're doing, in terms of the STEM initiative; but your approach to it -- okay? -- and how you're teaching the family group about helping your child to think through the problems, not giving them the answers. Because when they do get to college -- okay? -- they need to figure out how to do their laundry, and they need to figure out how to manage themselves, and the difficulties

that they face when they get there. More of our K through 12 systems need to be doing just that.

So I commend each and every one of you.

ALL: Thank you.

Assemblywoman Jasey.

ASSEMBLYWOMAN JASEY: Yes, I would just say, simply, all of our districts need to be doing this.

And as a former Board of Ed person, I'm wondering -- how is the sharing going? Are you -- do you have ample opportunities to share what you're doing with other districts?

DR. BROTSCHUL: We present quite frequently and articulate often; you know, kind of across all of the different types of sectors, in different districts reaching out, and us reaching out to them.

And you hit the nail on the head, regarding the Board of Education. Their commitment to this work is paramount to be able to allow us to execute the work broadly, and deeply, and as specifically as we can. And as time has evolved, their focus and their attention in the area of goal-setting, in the area of governance, in the area of curriculum and instruction, and in the area of finance, has allowed us to put 3,000 students in this position.

ASSEMBLYWOMAN JASEY: Thank you.

I appreciate, especially, the inclusiveness -- children with learning issues, all the way to children who don't speak the language. The inclusiveness is impressive; and congratulations.

ALL: Thank you.

MS. DeMICHELE: And you all have--

ASSEMBLYWOMAN JASEY: This is the best thing I've heard in a long time.

ALL: Thank you.

MS. DeMICHELE: This STEAM camp, for our children who are going in 3rd through 6th grade, has an art integrationist, which we specifically embedded as part of our ecosystem partnership. Perkins Center for the Arts works with us. And we have a certified art teacher in the classroom space as kids are working on engineering, robotics, coding, circuitry. And the embedded A is there.

For students who are older, they can attend a STEAM Academy, which you can actually see in the picture on the right.

MS. HUTCHINSON: The bottom right, yes.

MS. DeMICHELE: We have a Culinary Arts teacher, who works with our Horticulture teacher, to allow for the Farm-to-Fork experience, which gives the kids something that's a lot of fun.

ASSEMBLYWOMAN LAMPITT: That's wonderful.

MS. DeMICHELE: So if you're in South Jersey and have children or grandchildren--

MS. HUTCHINSON: It's not just for Delran students. The busing is just within Delran; but it is open to anybody who can get there.

ASSEMBLYWOMAN LAMPITT: That's wonderful.

MS. DeMICHELE: And if anybody wants copies of any of this, we do have a lot of copies; so we'd be happy to share it with anybody in the audience.

ASSEMBLYWOMAN LAMPITT: I think we have a few more questions or comments.

Assemblywoman Egan Jones.

ASSEMBLYWOMAN JONES: Yes, I just wanted to comment on the Bedtime Math part.

MS. HUTCHINSON: Yes.

ASSEMBLYWOMAN JONES: Because what we want to see is encouraging our kids to want to go into these areas that some just step back from, because they think they're not scientists.

MS. HUTCHINSON: And I'm sure Laura will highlight a little bit more.

But when we had those family engagement nights, part of what we shared-- And as Assemblyman Benson mentioned, there was a research study, that Bedtime Math has shared recently, about the gains that children made by doing Bedtime Math, and how they lasted several years after the students stopped doing it. But that the gains that children with self-identified "math anxious" parents made were greater than the students whose parents didn't identify that way. And we did share that research, and shared information about how to download the free app, and encouraged our parents to do so.

ASSEMBLYWOMAN JONES: Glad to see you're educating parents. (laughter)

MS. HUTCHINSON: Thank you.

ASSEMBLYWOMAN LAMPITT: Assemblywoman Mosquera.

ASSEMBLYWOMAN MOSQUERA: As one of those-- I love the fact-- One of those slides that I really enjoyed, and perked up my interest, is the Cradle-to-Career.

MS. HUTCHINSON: Yes.

ASSEMBLYWOMAN MOSQUERA: I'm a new mom; I have a 16-month-old daughter, and I am 7 months pregnant with my second daughter. So imagine how this topic is extremely important to me and my husband; our dream is that our daughters become doctors. (laughter)

MS. HUTCHINSON: Yes.

ASSEMBLYWOMAN MOSQUERA: That's our dream. Will it happen? We don't know; but that's our dream.

And we want them to be -- give them the right step forward. And what we want is to expose them to this STEAM.

And so I guess my question-- First of all, I have to say thank you so much for what you're doing for the students in Delran; and the parents and the community of Delran. It's amazing.

My first question goes to the Superintendent. I know that you basically reached up a little bit when Assemblywoman Jasey touched upon it, but I know that Superintendents talk to each other. Have you brought this up to the Superintendents Association when you guys get together?

ASSEMBLYWOMAN DiMASO: When you meet at your round table.

ASSEMBLYWOMAN MOSQUERA: At your round table events, and things like that. I know Superintendents talk. (laughter)

DR. BROTSCHUL: Yes, we tend to dialogue back and forth.

So there's been a lot of great sharing about the work that has taken place in Delran, frankly, through the STEM Pathways Network. They're kind of the PR arm of what we're able to do; they have a staff that they're able to allocate. We do articulate closely with the New Jersey Association of School Administrators, the NJEA.

It's really important to reinforce that our Teachers Association is on the front lines of this work. So we kind of have a broad set of capillaries and tentacles, throughout the state and throughout the region. Erica and Mary Jo present nationally; and now, internationally, we're being asked to, kind of, share our story. So they have been all over the country, thanks to the Overdeck Family Foundation and the STEM Pathways Network, kind of sharing things out.

We are proud that we were the first K to 12 District to be a member of the Network, and kind of accepted into this work; because of the passion and because of, frankly, the thought and the planning at the Board of Education level, and at the administrative level, in order to execute this work.

We host groups often; and it's very-- We're very open, as far as what our successes are and what our challenges are. But I keep going back to the passion and the commitment that the governing body in Delran Township has regarding this work. The Board of Education has absolutely served as the cheerleaders; and when it comes to developing budgets, and spending plans, and priorities, supporting the students on the front lines has been critical. We have testified in other areas, in other years, regarding the School Funding Reform Act of 2008; regarding Senate Bill 2. And our focus was returning that funding to the classroom level. And we now have a capital project in Delran that, frankly, I haven't seen any other district be able to execute. And it comes from the passion and the commitment from the Board of Education to allow us to engage in this work.

And now we have 3,000 students -- not just your high-achieving students at the high school level, or the middle school level -- but 3,000

students, K to 12, for whom we are designing a 6,000-square-foot space in order for them to fail, in order for them to grow, and in order for them to really dive in.

And so it's a long, circuitous route, to answer your question; but we have a great story, and we're happy to share it all over the place. And this is just, kind of, one stop on the tour.

So I appreciate it.

ASSEMBLYWOMAN MOSQUERA: Please do, and continue sharing it, and just keep at it; because it's something that I believe -- I think all of us believe that it should be done, statewide. And we hope that all school districts in the state will look at this and duplicate it, so it can fit for them properly.

MS. HUTCHINSON: We are.

ASSEMBLYWOMAN MOSQUERA: My next question -- if that is okay; I can ask another question? -- is the Cradle-to-Career. Specifically what does Delran do, in terms of helping parents who want to expose this STEM to their young children? We're talking about toddler ages.

MS. DeMICHELE: Toddler? Okay. (laughter)

So, you know, we're working. Our earliest STEM experiences, really, are through our K through 12 instruction and curricular programs in math and science. Of course, with the New Jersey Student Learning Standards in Science -- which were basically adopted from the Next Generation Science Standards -- it's very integrated. So NG design processes and thinking is embedded in everything. Our kindergartners are building ramps, and understanding forces in motion, and analyzing

ecosystem models -- and, you know, the living and the non-living components -- and then designing, and building, and planning.

But if you get down to your youngest children -- we haven't been able to reach that far yet, only because of the manpower of Mary Jo and I. (laughter)

MS. HUTCHINSON: Well, although -- our family engagement events are for everybody. So we did have this month -- for STEM Month, our family engagement events -- there were a bunch of, you know, strollers that came in with their older siblings. So we do openly encourage parents to bring their other kids.

MS. CASE: And I would say, at the State level, we have an Early Learning Priority Group. So the STEM Pathways Network has an Early Learning Priority Group -- you do have one of the handouts that they just created -- that's promoting events that are going on for Early Learners during STEM Month. And their next step is to develop a rubric to assess quality Early Learning STEM experiences, because I think a lot of parents don't know -- can't discern between what's good and what's not good for their students to participate in. It's not just a product of downloading an app and hoping that that works. So that will be the next step for that Priority Action Group; but that's operating at the State level.

ASSEMBLYWOMAN LAMPITT: We can't thank you enough for coming; and we are very impressed. I think you've captivated us, and I encourage all of the members to reach out to you; and maybe we can organize something that the members can come, in an organized way, to come visit you and to see it firsthand.

And Gabby, I have no question about the fact that I am buying your new baby a doctor's bag. (laughter)

Thank you.

ALL: Thank you.

ASSEMBLYWOMAN LAMPITT: We're going to bring up, next, Kit Nugent, who is Vice President of External Engagement in Students 2 Science; and Paul Winslow, who is the President and Co-Founder of Students 2 Science.

Welcome.

**KIT NUGENT:** Thank you.

**PAUL WINSLOW:** Better get the timer ready. Anyone who knows me, knows I can't even say "hello" in five minutes. (laughter)

ASSEMBLYMAN ZWICKER: Time's up. (laughter)

MR. WINSLOW: Thanks; any questions?

ASSEMBLYWOMAN LAMPITT: It starts when you sat down.

MR. WINSLOW: Any questions?

So as you said, I'm Paul Winslow, the Co-Founder of Students 2 Science.

Students 2 Science was founded 10 years ago by a group of entrepreneurial scientists who witnessed, firsthand, the need for more rigorous STEM education in the state in order for us to meet the needs of the corporations.

What you're going to see with Students 2 Science is -- we come, pretty much, from the corporate side, from the end-user side. Making that connection to the careers is pivotal and critical in our mission.

So our mission is to inspire, motivate, and educate elementary, middle, and high school students to pursue careers in STEM. Since our inception 10 years ago, we've hosted and interacted with over 100,000 students from 5th through 12th grade.

We consider our program a model. It's been supported by over a thousand volunteer mentors from some of New Jersey's largest and leading employers, such as Bayer, Becton Dickinson, Merck, PSE&G, Panasonic, and corporations like that.

What's important to note is that almost 90 percent of the students who participate in our programs come from at-risk communities, such as Newark, Jersey City, Paterson, Irvington, North Plainfield, and those types of communities.

Our belief is to start early and bring the career knowledge, earnings potential, and college and career criteria to our students so that they can make informed decisions as they graduate from high school, and as they pursue either a job in the workplace or go on to colleges and universities.

Today, we have a way to track that progress through our Newark model. In 2016, we entered into a formal partnership with Newark's Board of Education; the City of Newark; the community partners, including corporate and higher ed partners; local politicians; City Council members; State Senator Teresa Ruiz, and U.S. Senator Cory Booker, to bring the program district-wide into Newark, all 32,000 students.

The program -- the model consists of three individual programs. Our ISAAC Program is where middle school and high school students come into a 10,000-square-foot commercial laboratory, equipped

with millions of dollars' worth of sophisticated, analytical instrumentation; work to solve real-life problems alongside some of our corporate partners -- employees -- who serve as mentors during those visits. And by doing so, we're introducing them to a wide range of STEM industries and the career opportunities.

Our Virtual Lab program is a remote web-based solution that eliminates geographic and language constraints. It's available in 200 spoken languages through on-demand interpreters. In this program, our instructors conduct hands-on experiments directly into the classroom of traditional schools; as well as non-traditional settings, such as the Boys and Girls Clubs, hospitals, after-school programs, summer programs, and things like that.

The way the program works is teachers receive science kits that contain all of the supplies necessary for 26 kids to actually conduct the experiments in their classrooms. And also we provide them with training materials, lesson plans that align with the Next Gen Science Standards, and how-to videos, so that they're prepared to assist and ultimately run these programs on their own. Ninety percent of the teachers who go through a single program with us will then run these programs by themselves.

The experience is a turnkey solution, primarily for urban districts; those that are challenged with high turnover rates of STEM educators, limited funding, language barriers. And so, you know, again, turnkey and easy for them to implement it.

Lastly, we provide professional development and technical assistance for the teachers.

I heard that you found out that your alma mater is coming to visit us on March 31; but they will be coming to Dwight Morrow; high school students will be coming on March 31 to what we call *Pharmaceutical Science Day*. High school students will be immersed, for a full day, in the laboratory, surrounded by professional scientists in the pharmaceutical industry. And they will explore all the different kinds of career opportunities that they would have in the healthcare industries in our state.

Today we have two locations; one in East Hanover and one in Newark. And we believe that we are in position -- and with appropriate funding -- that we can take our V-Lab and generate more centers throughout the state.

At this time, I'll introduce Kit, and I'm going to let her talk about some of the policy issues and recommendations.

MS. NUGENT: Thank you, Paul.

I wish we did have more time, because I'd love for you to hear about Paul's career.

So Students 2 Science is a very unique and extraordinary experience; and we welcome you all to come; and we want you to see it.

And Assemblywoman Jasey has been with us, in Newark, and has seen the model program. She's heard from the Superintendent himself about the power of that program and the alignment to the District in reaching all 32,000 students.

But Paul's experience -- working with the major pharmaceutical, life sciences, and other STEM employers in the state -- really led to this experience, where we start from 5th to 12th grade. And so when we look at the possibilities, because of the Newark model, because of

the ecosystem, and because of our great higher ed and corporate partners -- like PSE&G, and Panasonic, and Sanofi, and others -- that there is a great opportunity to really look at what career and technical education looks like as we explore pathways.

The District is moving from cradle to career. There are opportunities to work with the comprehensive high schools, because corporate partners, as well as higher ed partners, will be identified; and all of these students will start by going through Students 2 Science. So we believe the career and technical education within the state will help elevate experiences, in particular for urban areas. So we would be a great advocate for that.

In addition to that, we believe that aligning STEM education in the state to high-demand careers is absolutely essential. Before our work at Students 2 Science in some of the new districts that we've added -- like Jersey City, where our students participate fully in the laboratory, in the V-Lab -- what we saw was that STEM -- while there was a desire to build career and technical education in academies -- that there was not an emphasis on authentic STEM. So we would say, "Please look at the high-demand careers that live within the state, our employers -- understand their needs, and look for opportunities to grow from that perspective."

Another benefit of our program -- which we believe is very powerful, and this can be demonstrated in the Newark model as well -- is to look for opportunities within the state where professional development opportunities for teachers, to learn about employment opportunities in the state and to understand what those high-demand careers, are. So teachers participate with us, they receive professional development. They work in

the laboratories with our scientists, with our corporate mentors, and they have onboarding. And we have a STEM camp this summer, where they really do learn not only about the science literacy -- how to use the laboratory in the V-Lab -- but to understand the careers themselves. So we would be a great advocate for that.

And in addition to that, we would say that there is a time, that is building right now, that we can see in the state where there's an opportunity for the public and the private sector to work together to drive towards mutual goals, where students join the workforce of tomorrow. And we see a bright future where there could be a blended funding stream of, possibly, 50 percent public and 50 percent private. We see a commitment on both sides that is very earnest; and we believe that there's confidence coming from some of our major STEM employers in the state.

So we thank you for this opportunity today. We invite you all to please come to the laboratory, either in Newark or East Hanover.

And we have some information, which we'll share today; but I'd love to follow up with Cat to make sure that we get all of your e-mail addresses so we could send you further information.

ASSEMBLYMAN ZWICKER: Thank you to you both.

I have one question; but before I do, I have to, of course, say, "Go, Maroon Raiders," from Dwight Morrow High School. (laughter)

MS. NUGENT: Of course.

ASSEMBLYMAN ZWICKER: So I want to come back to the last thing you just talked about. But before I do, it really gets to an interesting point.

So last year, Governor Murphy signed a piece of legislation -- that several of us up here worked on -- that provides loan forgiveness for New Jersey undergraduates who major in a STEM field and then stay in one of these high-need, high-growth fields. And it's a partnership where the State provides up to \$4,000 of loan forgiveness if the private sector will provide up to \$4,000.

And so it's an example where -- right to your last comment, that I just wanted to bring out a little bit more -- where there is an opportunity for a genuine partnership, a public-private partnership.

MS. NUGENT: Yes.

ASSEMBLYMAN ZWICKER: In this case, it's about the high cost of an undergraduate degree.

MS. NUGENT: Yes.

ASSEMBLYMAN ZWICKER: But you're getting at something which I think is really key -- is that, as we're hearing from everybody, we need to burrow down and look carefully at how we can do something similar in the model that you've worked on, from the private sector, to the school system, to the public sector, and private. So it's a really interesting combination.

I think the question I just want to ask -- it's an open-ended question -- is, as you know, New Jersey is in a significant economic -- what's the right word I want to use here? Help me out (laughter) -- stress.

ASSEMBLYWOMAN LAMPITT: Stress.

ASSEMBLYMAN ZWICKER: Stress, right? Challenge--

ASSEMBLYWOMAN LAMPITT: Yes; Challenge.

ASSEMBLYMAN ZWICKER: I like *challenge* better.

ASSEMBLYWOMAN LAMPITT: Pathway.

ASSEMBLYMAN ZWICKER: Wait; no, it's not *pathway*; *pipeline*.

ASSEMBLYWOMAN LAMPITT: Pipeline.

ASSEMBLYMAN ZWICKER: It's one of those. (laughter)

We have challenges, right?

MS. NUGENT: Yes.

ASSEMBLYMAN ZWICKER: And there's no doubt that your program -- and the programs we heard before and the programs we're about to hear -- are doing tremendous, tremendous work.

MS. NUGENT: Yes.

ASSEMBLYMAN ZWICKER: It is a challenge, right? And so I think it's a question of, is there -- can the private sector -- I'll make it an easy question for you -- can the private sector do this on its own? What do we do when we're under tremendous economic challenge?

If you could just respond to that; you know, how do we handle this?

MS. NUGENT: I'll answer; then Paul may have another.

But I don't believe that one sector can do it by themselves; I really don't. And I think that-- I've done Students 2 Science -- it'll be almost four years now. But Paul's relationships with these corporate partners and their understanding of the skills that we provide to students was very real. And what they wanted to hear, over and over again, was what the public sector -- what skin in the game do they have?

And through this ecosystem we built -- which is, I think, a phenomenal statement for the State of New Jersey -- this model; where the

Newark Public School District, Newark Board of Education, Council members, local politicians, corporate partners, and higher ed partners got together and said, “This is something we want to build.” But it was the public and private sector together. I don’t believe that one sector can do it, because there are mutual goals that need to be established.

ASSEMBLYMAN ZWICKER: Thank you.

ASSEMBLYWOMAN JONES: I want to add just a little bit to that.

My colleague, Assemblyman Spearman, has been working diligently on a program that would bring employers into the process; give them a tax break later on as they hire these people.

MS. NUGENT: Yes.

ASSEMBLYWOMAN JONES: He’s been working with the Department of Labor. Labor also has some very far-reaching programs that they’re putting on the books. So we all need to take a look at them to see how they’re going to fit here.

But I am very enthused about my colleague’s legislation. It probably won’t get read into the record until Monday; but he has worked diligently on it, with all sectors of the population.

And I’m trying to figure out why you’re not in Camden right now. (laughter)

MS. NUGENT: We would love to be in Camden.

ASSEMBLYWOMAN JONES: That’s a question for another day, for us to have; yes.

MS. NUGENT: That’s right; we would love to be in Camden.

ASSEMBLYWOMAN JONES: Thank you very much.

Thank you.

ASSEMBLYMAN ZWICKER: Assemblywoman.

ASSEMBLYWOMAN TIMBERLAKE: How-- Speaking of Camden -- but then again, also in our District, with East Orange -- how is it that you expend and select the different municipalities in which you work?

MR. WINSLOW: So there are a couple different ways.

But the primary way is -- our funding model is to actually go to the corporations for funding. That's -- 90 percent of our funding comes from corporations.

So what we'll do is, we'll identify a corporate sponsor; and many times they will say, "We would like you to work with Somerset County, okay?" Or, "We would like you to work with the Newark Public School System or Jersey City." So the funding, sometimes, dictates it.

Most of the time the funding will dictate that it has to be an underserved community, okay? So once we obtain funding, then we will go, based on the parameters that we get from the grantors to go to these areas. There are instances where we will work within a school district, because there's a tremendous willingness; there's a tremendous need. Irvington is a perfect example of that; Irvington is the ugly stepchild to Newark. And we service the entire school district, and it's funded almost fully by the Board, because you can't get funding for Irvington, okay?

So it's really, you know-- I'm sorry to say, funding drives most of it.

MS. NUGENT: But I would encourage you -- leadership in East Orange-- If they're interested in the program, please call me. I will make sure you have my card, because we have a list. And so when we

obtain funding, and we look for opportunities, the leadership in the district -- the leadership at the principal level, the administrators, the teachers, etc. -- that's really a decision-breaking call for us. We'll say, "East Orange has been pounding on it. You know, they really want it. They want the V-Lab Program; they want to see their kids in the laboratory."

And so when an opportunity presents itself, we would certainly go to East Orange if we have that kind of communication.

ASSEMBLYWOMAN TIMBERLAKE: Thank you; I definitely will do that.

East Orange has a STEM high school, as does Orange. They now have a brand new STEM high school.

MS. NUGENT: Wonderful.

ASSEMBLYWOMAN JASEY: Just kudos; you know, I can't believe it's been four years. And that was exciting. I have to get back to see it again, because watching the students in the virtual labs-- I mean, it just goes to show that it's all about opportunity and exposure, not aptitude or ability, you know? And we have to-- I think, what we're hearing this morning, that excites me, is we have people thinking along those lines. And I will say, as Chair of Higher Ed, this is something that we're working closely with Ed; I love being on both Committees, because it's all interconnected.

MS. NUGENT: Absolutely.

ASSEMBLYWOMAN JASEY: And I love the fact that we have all these conversations and actual work going on that is interconnected.

So I thank you for coming today.

MS. NUGENT: Come back. (laughter)

ASSEMBLYWOMAN JASEY: I will, I will.

ASSEMBLYWOMAN LAMPITT: Well, we thank very much.

Certainly, you know, when we talk about the aspects of STEM and the exposure to our young people -- who knows whether or not the excitement and the intrigue of all of it will make one of them a welder one day, and how science and welding is really very important, you know? Or maybe, the person who we're actually exciting, may serve to solve Alzheimer's one day. It's just about the exposure -- what Assemblywoman Jasey had to say.

So thank you, thank you.

MS. NUGENT: Well, thank you.

ASSEMBLYMAN ZWICKER: Thank you so much.

MS. NUGENT: In closing, if I can just thank Laura Overdeck and the STEM Pathways; because I can say that prior to-- So I'm back in New Jersey seven year; I can say that there was a void, in terms of the conversation happening on a real level. And people were trying to figure out, "How do we do this? How do we get this to public policy? Why isn't this a priority?"

ASSEMBLYWOMAN LAMPITT: Right.

MS. NUGENT: And I believe that the STEM Pathways, and Laura and John's work, has made a significant difference in the state. And I hope that you all do encourage others to join and be a part of it, and we're very proud of that.

So thank you to STEM Pathways, and to Laura.

ASSEMBLYWOMAN LAMPITT: Thank you.

ASSEMBLYMAN ZWICKER: We'll thank her when she comes up to testify. (laughter)

Next, from Tween Tech, Dawn Watkins and Amanda Ota.

ASSEMBLYWOMAN LAMPITT: It's still good morning.

**D A W N N. W A T K I N S:** Good morning.

ASSEMBLYMAN ZWICKER: Good morning.

**A M A N D A O T A, Ed.D.:** Good morning.

MS. WATKINS: My name is Dawn Watkins, and this is Amanda Ota.

I'm the President of the Cumberland County Chapter of American Association of University Women.

So we are here today to just give you a brief synopsis of what we've been doing in Cumberland County. As you know, we are a rural community, and we lack a lot of STEM programs. We lack funding, we lack resources.

And so the reason why I established the branch in Cumberland County was to make sure that we begin to bring STEM opportunities to the area.

And so we are a fairly new branch, but we've been making some great progress. And so thanks to my partner here (indicates), we were able to pull off the first county-wide STEM initiative for middle school girls. And as the first panelists spoke earlier, it is very important that STEM interest begins in middle school. It's the most important time of their education.

And so that's what Tween Tech is. It is a one-day STEM event for middle school girls.

And I will let Amanda talk about some of the program that she had to operate while I was working on my dissertation in Guatemala.  
(laughter)

MS. OTA: Good morning, everybody.

My name is Amanda Ota. We have come all the way from the South-- Well, I don't know how south -- we are really south. (laughter)

MS. WATKINS: Really south.

MS. OTA: Vineland.

So I work right at Cumberland County College, which I think is going to change to Rowan College of South Jersey.

MS. WATKINS: She represents Wilmington University.

MS. OTA: Yes, yes; so I work for Wilmington University, but we are located right there, at Cumberland County College.

So when Dawn and I started talking last year -- just briefly; it was not even formal -- we started talking about what is it that we can do to bring change into our County.

So then we started just brainstorming. We actually decided to meet that afternoon -- evening, and we wrote some things on the Smartboard, and events that we were going to do. But Tween Tech was, you know, our first project. So we literally made it happen.

So last week, Friday -- and the weather really, really permitted us to do it -- we had 200 middle schools students come from all sectors of Cumberland County; all middle schools. And we had issues at the beginning selling this. We sent out e-mails to Superintendents; we didn't get any response. And then we finally reached out to the coordinators of

the programs at the school districts, who were really, really excited about the program.

We had 15 facilitators -- from robotics, to Python basics, to *What is DNA?*, to CSI workshops. And it was really, really fascinating, when I was going around the classrooms, just watching, as you could see through the glass -- our students. And I literally-- When I saw them, I saw that it was their first time having goggles on, and lab coats, and just being in the labs.

We had workshops from creating lip gloss, to like the (indicates) -- dissecting, and literally studying about DNA.

And all of our facilitators were professionals, from Rowan University, from Stockton, from Apple; we actually had facilitators from Apple. And who did we have for CSI?

MS. WATKINS: We had law enforcement--

MS. OTA: We had law enforcement involved; yes. So they literally -- it was five law enforcement who came.

And one of our professors, who is a Criminal Justice Professor, who actually-- His classroom was full, and he had it in a lecture hall.

So it was really a fascinating event. And we had 20 volunteers from the high school, all were girls. And we wanted this to be geared towards girls; and it was. It was a very successful event.

And then, at the end of the day, we had partnered up with-- Wilmington University sponsored us, but we had partnered up completely with a Science Symposium from the STEM Program of Cumberland, which they had money, but we didn't. So they had brought a keynote speaker from the National Defense, who was really, really amazing. She drove all

the way from Washington D.C. to be a keynote speaker for the final event, which closed down that event.

She mentioned finance. We literally had to take money out of our own pocket to buy supplies for the facilitators because, as she had said, we started from scratch.

But it was just so exciting. We've been getting e-mails and phone calls, left and right. I mean, it's been really, really-- And actually, we have a date for next year; that's how excited everybody is.

And moving forward, we actually just secured a date. Cumberland County College has been very supportive with this. They gave us the grounds for free; we didn't even pay. But the supplies -- it was just us buying all of that; it came from our pocket.

But our next event -- which just is going to involve, also, the girls in STEM -- is going to be-- We're not calling it a *marathon*; it's going to be the *Wellness 5K*. So it's going to be a 5K, running and walking; but our strong emphasis is that we are going to have high school girls from the high schools who are CNA-certified, who are going to be taking blood pressure for people who are attending the 5K. It's voluntary -- all of that -- and they'll be taking their sugar levels, and all of this. And so we're really excited about that event that is coming up.

So we're gearing everything towards girls; and we are exposing them to the science fields.

MS. WATKINS: So our goal is to inspire, to motivate, and to create a network that will assist in dismissing stereotypes, and demonstrate that women can, and that they do, thrive in the STEM careers.

And so, basically, our model is to partner with local organizations and schools to make sure that whatever other programs we decide to implement in the future will be successful; because we do not have any large industries in Cumberland County. We don't have the Lockheed Martin; we don't have other large resources.

So to offset some of our funding issues, we're going to be hosting a masquerade ball in October, to fundraise and help assist with some of our funding issues.

But just a little background information about the AAUW.

It's been around since 1881, and we have several branches here in New Jersey. But, of course, in Cumberland County, at the time, I was the only representative. And so AAUW sponsors Tween Tech, Teen Tech, and Tech Trek; and the idea was -- why is it that our students in Cumberland County do not have access to these programs? And so this is our initial step in making sure that our girls in Cumberland County have access to more STEM opportunities.

We are looking to bring other STEM programs; we're looking to create a couple of our own and, maybe, have some sort of mentoring program. We're going to flesh out the ideas, but the whole goal is to make sure that our students are not left behind.

ASSEMBLYWOMAN LAMPITT: That's wonderful.

My quick question is -- the opportunity for hearings like this is for people who attend to also hear from other people -- what is going on in the State of New Jersey.

Did you hear anything today, from others who have already testified, that you weren't aware of that sort of ignited something within

both of you to say, “Yes, that’s what we want to do for Cumberland; that’s what we want to do for our students”?

MS. WATKINS: Well, actually, because we are both educators, we were both excited about Delran’s project. And we could definitely see that working in a couple of the school districts.

We were partners in another program as well -- bringing early college high schools to South Jersey, to Cumberland County, and a few other areas in Cumberland. But we were just excited about how that could possibly work; and then -- oh, she’s gone now -- but I was wanting to see -- connect with her to see what we can do to partner--

ASSEMBLYMAN ZWICKER: Dr. Misra; but we can connect you, right?

ASSEMBLYWOMAN LAMPITT: Yes.

MS. WATKINS: Yes; okay.

ASSEMBLYMAN ZWICKER: I’d also say what you’re going to see-- First of all, congratulations on everything you’ve done, and what’s about to happen.

MS. WATKINS: Thank you.

ASSEMBLYMAN ZWICKER: But one of my takeaways already is that we are siloed across the state. And there’s a real question of, are there things we can do to help break down those walls.

But I absolutely urge you not just to talk to the people you’ve already heard, but the people who are still yet to testify -- there is so much overlap.

ASSEMBLYWOMAN LAMPITT: Well, thank you.

Any questions?

ASSEMBLYWOMAN JASEY: Thank you.

ASSEMBLYWOMAN DiMASO: What's the date of your--

ASSEMBLYWOMAN JONES: The run?

MS. WATKINS: The masquerade?

ASSEMBLYWOMAN DiMASO: Not the-- Well, all the dates.

So you said you already have a date for the program you ran with all the professors--

MS. OTA: May 20, 2019.

ASSEMBLYWOMAN LAMPITT: We'll ask you to just share the dates with the aides, and--

ASSEMBLYWOMAN DiMASO: Yes, yes; if you can, through the Chairs, send everything.

MS. OTA: Yes, yes.

MS. WATKINS: Absolutely.

ASSEMBLYWOMAN LAMPITT: So thank you.

ASSEMBLYWOMAN DiMASO: And I love her. (laughter)

ASSEMBLYMAN ZWICKER: If you reach out to our staff -- right? -- we can connect. So even if Dr. Misra has left, we have contact information.

ASSEMBLYWOMAN LAMPITT: Right.

Thank you.

MS. WATKINS: Thank you so much.

I just wanted to give you a little synopsis in your packet.

On the last page was one of the surveys that the students had taken. I mean, there was a ton, but we wanted to just give you a little--

ASSEMBLYWOMAN LAMPITT: We don't have that.

ASSEMBLYMAN ZWICKER: It's coming around.

ASSEMBLYWOMAN LAMPITT: It's coming around; all right.

MS. WATKINS: Yes, we just wanted to give you a little synopsis of what they were learning and what they were doing; and their responses.

ASSEMBLYWOMAN LAMPITT: Thank you; thank you very much.

MS. WATKINS: Thank you so much.

MS. OTA: Okay; thank you.

ASSEMBLYWOMAN JONES: You have done an extraordinary thing for those gals, and others, in Cumberland County.

MS. OTA: Thank you.

ASSEMBLYWOMAN JONES: Thank you so much

MS. OTA: Thank you.

MS. WATKINS: That's what we keep hearing. (laughter)

ASSEMBLYWOMAN JONES: That's how all good things get started -- by people like you.

MS. OTA: Yes; thank you.

MS. WATKINS: Thank you.

ASSEMBLYMAN ZWICKER: So one of the-- I definitely would encourage you, also-- We're going to have -- our next speaker is Deedee Ortiz from the Princeton Plasma Physics Laboratory, who is going to tell us about a program similar to yours.

As she's coming up-- For the members of the Committee and for the staff, our next speaker brought gifts. (laughter)

Come on up.

**D E E D E E O R T I Z:** (off mike) I bake when I'm stressed, okay?  
(laughter)

**ASSEMBLYMAN ZWICKER:** So, Ms. Ortiz, what have you baked?

**MS. ORTIZ:** These are called *French macarons*; they got a little squished on the way up here.

**ASSEMBLYMAN ZWICKER:** So we have French macarons after the Committee hearing for everybody.

**MS. ORTIZ:** French macarons.

So I want to focus my attention on you ladies, from what you just said; because what I'm going to talk about I think will really interest you, and I hope that we can possibly work together--

**MS. WATKINS:** (off mike) Yes.

**MS. ORTIZ:** --in the very near future.

I'm going to talk about a program that we hold at the Lab. I think Chairwoman Lampitt asked Shannon a question about what programs we might possibly have for young women at our labs. I'm going to touch a little bit on that.

I'm just going to read, though.

Good morning, Chairwoman Lampitt, Chairman Zwicker, and members of the Committee.

Thank you for the opportunity to address you today.

My name is Deedee Ortiz, and I am the Program Manager for the Science Education Department at the Princeton Plasma Physics Laboratory. In this role, I promote the Laboratory's work in Fusion, Energy Research, and engage the community through a variety of STEM initiatives.

While my audience mostly consists of the general public I, as the rest of our team, have a really strong interest in students, especially those in traditionally underserved STEM fields and districts.

As my colleague, Shannon Greco, has already stated, the number of women in STEM fields -- which has grown in recent years -- is still not where it should be. This is where I introduce you to a particular STEM initiative, geared towards facilitating that growth.

Tomorrow, over 750 young women in grades 7 through 10, from about 75 different schools -- in New Jersey, Pennsylvania, Delaware, and a group from as far away as Mount Rainier, Maryland -- will be at Princeton University to attend the Young Women's Conference in STEM, as we celebrate its 18th year in a row.

For reference, this conference began first at PPPL in 2001, with about 150 women; so it's grown exponentially. They will have a very busy, educational, and fun day ahead of them. It will begin with a hands-on session, with a host of exhibitors, where they will experience state-of-the-art scientific and engineering experiments from STEM projects. From the FBI Evidence Response Forensics Team, analyzing blood spatter, bone fragments, and bullet trajectory; to Lockheed Martin's fighter jet technology; from a 3-D printed, life-size model of the human brain with special goggles that will allow them to see inside of the brain, courtesy of Liberty Science Center; to the New Jersey Department of Environmental Protection; and, of course, the lead, Plasma Physics.

New this year -- we will have a rep from Princeton University's Office of the Provost, and he'll be on hand to discuss pathways to college; because it's never too early to think about college, especially in an

environment exposing all of the STEM opportunities that a college can potentially unlock.

There will be a panel discussion of women in a variety of STEM fields, which actually Dr. Misra and her Association will be speaking at that panel. They will also have a table at the exhibitors' event, the hands-on session. So we partner with them every year.

They'll be discussing their unique path to and through STEM, and how students can learn from their journey. The conference will end with the keynote lecture by Dr. Tammy Ma, a plasma physicist at Lawrence Livermore National Laboratory.

If the numbers for female representation in STEM were not already sobering, it is even more so in plasma physics, where the percentage of female plasma physicists are at a mere 7 percent. Dr. Ma, by the way, just received an award for Woman of the Year from the 16th Legislative District in California.

ASSEMBLYMAN ZWICKER: I had nothing to do with that.  
(laughter)

MS. ORTIZ: Are you sure?

During the YWC, the students will network with each other, seeing for themselves a tremendous number of other young women interested in STEM. They will also network with professional female scientists and engineers, talking one-on-one with them about their love of science and some challenges that they may encounter.

I wish that when I was a kid I had a program like this offered to me, because it would have changed my whole path in life, I think. But if you don't mind, I'm going to share a little story with you.

When I was in middle school, I loved science; it was my favorite subject. No matter what I saw, I just wanted to learn more. I was fascinated about all of the cool things we were learning, and it was just wonderful for me.

During my classes, the boys were assigned as the scientists; the girls were the assistants. The boys would perform all the experiments and do all the fun, hands-on things; the girls would observe, jot down notes, and be in charge of organizing all the equipment, and putting everything away. And that was our team effort in my classes.

So, of course, I grew bored; and I focused my interest elsewhere. I also actually ended up going to school for marketing, because of what happened in middle school.

On a personal level, I feel that I am responsible -- it is my responsibility to continue to showcase successful female scientists and engineers to the attending students every year, to continue to grow this conference so that even more young women can experience the world of opportunities at this event; can be made aware of. The connections that these students make with the scientists and engineers may take root and potentially jumpstart their own future careers in STEM.

Equally as important is the connection that our scientists and engineers make with the students. These STEM experts know what it takes to grow and thrive in an environment that has been largely unaccommodating to women; and that this is their opportunity to provide guidance to the next generation of female scientists and engineers.

Because the universe works in very mysterious ways, managing this program for the past few years has awakened that little girl in me that

loved science so much. And while I didn't have the chance to do something like this when I was their age, it's become my passion to provide this chance to all young women that I possibly can of this generation. My purpose in STEM now is to showcase the pathways that are possible.

I'd be remiss if I didn't mention that the success of the Women's Conference in STEM is due to many factors; but mostly to the exhibitors, the breakout, and keynote speakers, the female scientists, and engineers from universities, corporations, government institutions; and the volunteers who, year after year, give selflessly of their time to provide a day of inspiration. For that, we are grateful and proud to join others at the forefront of this initiative so that we may offer as many opportunities as we can to as many students as we can.

And thank you.

ASSEMBLYWOMAN LAMPITT: No, thank *you* very much.

So Deedee, how many years have you been doing this at Princeton?

MS. ORTIZ: I think this is my sixth year.

ASSEMBLYWOMAN LAMPITT: Sixth year.

So all of this is told through some sort of personal story; and you shared yours, in terms of being inspired and everything.

Is there a story that you can tell us about a young female who went to your program; who went on, maybe to Princeton, who maybe has now gone on to do something in the STEM field?

MS. ORTIZ: There is.

ASSEMBLYWOMAN LAMPITT: There's always somebody who ignites us.

MS. ORTIZ: Yes, absolutely.

A few years ago, a mother -- who has always followed the event for many years -- had brought her daughter into the event one year. She took her in, kicking and screaming; she didn't want to come, she hated science, it wasn't for her, it was too difficult.

And she came back a couple of years later -- without the daughter, just because she knew we were going to be holding the event -- and said, "I want to talk to you. When I brought my daughter here, she hated science. And this day absolutely changed her life." She's now a chemist. I don't know where she went to school, but I know she's a chemist.

ASSEMBLYWOMAN LAMPITT: Thank you.

Any comments or questions?

Assemblywoman Mosquera.

ASSEMBLYWOMAN MOSQUERA: Yes; how do you-- Thank you for what you do. How do you market this to young ladies across the state, and where do you get the population that you get every year?

MS. ORTIZ: So the short answer -- we don't market it.

ASSEMBLYWOMAN MOSQUERA: Okay; so how do they--

MS. ORTIZ: The demand is overwhelming; people who know that the event is going to happen have spread the word. In any given year, we have 200 girls on the waitlist.

ASSEMBLYWOMAN MOSQUERA: Wow.

MS. ORTIZ: And right now, we're up to 750 girls this year alone.

We take schools that are from Title 1 districts, underserved schools; and while every other school is allowed to bring 10 girls to the event -- because it's so overwhelming -- these schools that need more can bring 20 girls. And that's the best way that we can manage, because it's so, so overwhelming in demand.

ASSEMBLYWOMAN MOSQUERA: I'm sorry; could you repeat that?

MS. ORTIZ: It's overwhelming; it's just overwhelming.

ASSEMBLYWOMAN MOSQUERA: No, the Title 1--

MS. ORTIZ: Title 1 schools, underserved districts; (indiscernible) like that. They get to bring double the girls because that's who we want there.

ASSEMBLYWOMAN MOSQUERA: So every school gets 10; and they get 20.

MS. ORTIZ: Yes.

ASSEMBLYWOMAN JONES: Did you ever think about doing it a second time a year, since it's so overwhelming?

MS. ORTIZ: We get that a lot. (laughter)

ASSEMBLYWOMAN JONES: Just sayin'.

MS. ORTIZ: My ultimate goal-- Personally, I want to grow it nationwide. Because it's not just in New Jersey that we need this--

ASSEMBLYWOMAN JONES: Of course not.

MS. ORTIZ: --it's a lot of other places.

I think the biggest constraint would be volunteers, and getting enough people to give more of their time who already volunteer from institutions.

I don't know; we want to. It's a challenge.

ASSEMBLYWOMAN JONES: Oh, yes; and thank you.

MS. ORTIZ: You're welcome; thank you.

ASSEMBLYMAN ZWICKER: And you said it quickly, but I just got the question.

Could you just remind us again -- when is the 2019 Young Women's Conference?

MS. ORTIZ: Tomorrow, at the University. (laughter) Feel free to stop by.

ASSEMBLYWOMAN JASEY: No wonder you're stressed. (laughter)

ASSEMBLYWOMAN DiMASO: Just a little bit.

MS. ORTIZ: No, no; I'm good.

ASSEMBLYWOMAN LAMPITT: Well, we appreciate you coming.

MS. ORTIZ: Well, with that, I have to say -- I'm going to have to apologize, because I'm going to have to run out to go set up for tomorrow.

ASSEMBLYWOMAN LAMPITT: Yes.

ASSEMBLYMAN ZWICKER: Before you go, I want to follow up a question that has already been asked, which is -- the demand is overwhelming. What's limiting us from going to 1,000, or 1,200, or more? Why not go higher?

MS. ORTIZ: We're limited by space, we're limited by funding. It's just a matter of getting a bigger area and getting more money to be able to support more people who come down and visit us for the day.

ASSEMBLYMAN ZWICKER: Or perhaps, I mean, instead of twice at one place -- sort of what we heard before -- perhaps you can start coordinating around the state at the same time.

ASSEMBLYWOMAN JASEY: You know what I'm wondering about -- excuse me -- is the partnership with business. Because I'm thinking about -- we have a lot of large successful businesses in the state already. And perhaps their employees might be willing to give some time to do a program like this. You already have the structure, the agenda; you know how to do it. Perhaps it's time to scale up and share the wealth--

MS. ORTIZ: I agree.

ASSEMBLYWOMAN JASEY: --if you will.

MS. ORTIZ: Absolutely.

ASSEMBLYWOMAN LAMPITT: Great ideas, great ideas.

MS. ORTIZ: That's my dream.

ASSEMBLYWOMAN DiMASO: In my community is the Bell Works building, which was Bell Labs. It's a 2 million-square-foot-- I see everybody shaking their head; that's why I'm going to call you, Kim. And they run different programming and do different things. But it's really when I walk through the building -- that's where my office is also, actually -- it's mostly boys. So I would really love to reach out to you; and maybe, to your point, have your program brought there. Maybe on a little bit smaller scale, but maybe the area--

MS. ORTIZ: Let's do it.

ASSEMBLYWOMAN DiMASO: You know?

MS. ORTIZ: Yes.

ASSEMBLYWOMAN DiMASO: Let's-- We'll all help you.

ASSEMBLYWOMAN LAMPITT: She'll be baking lots of macaroons. (laughter)

MS. ORTIZ: Oh, yes; oh, yes.

And also, if I may, I'm happy to share resources of our exhibitors with you so that you can have more people come (indiscernible). (laughter)

ASSEMBLYWOMAN LAMPITT: This is wonderful; this is really--

MS. ORTIZ: Good partnership.

ASSEMBLYWOMAN LAMPITT: Next, we have the infamous Laura Overdeck, the Founder and President of Bedtime Math. And Jade, who is sitting to my right, who is a new stepmom, shared with me that at the Cherry Hill Library they do Bedtime Math, and she's excited to bring--

**L A U R A O V E R D E C K:** Thank you.

ASSEMBLYWOMAN LAMPITT: So we're very excited for you to be here.

MS. OVERDECK: Well, thank you, Chair Lampitt, Chair Zwicker, members of the Committee.

I'm really glad to be here.

I'm Laura Overdeck, and I'm a *STEMinist*; I never had heard that term until today, and I love it. (laughter)

And I am the Founder of Bedtime Math; I have some of our leadership with me here today.

And we started seven years ago; and along the way our learnings have shown a lot of really dire inequity, but also some clues on

how I think we can bring more kids into the STEM pipeline; and how you all, as legislators, are empowered to do that.

Just as quick background, for those who are not acquainted with Bedtime Math -- it's a pretty simple concept. We all know to read to kids at night; and then they love books and become great readers. Why don't we do math? So we serve up a nightly math problem for parents to do with their kids every night. And it's a story, followed by three questions of varying levels of challenge.

And University of Chicago researchers -- as was mentioned by our Delran team -- found that, in a randomized control trial, children who did our math app -- while others did a reading app -- the ones who did our app just a few times a week ended up three months ahead in their math skills in one school year; which is pretty astonishing for a free resource that takes minutes a day.

And, in fact -- as was mentioned -- the families where the parents were the least comfortable with math -- those kids had bigger gains of four or five months, because the culture changed in the house. They started thinking about math differently.

So how did this happen? Well, for one, the math problems are very engaging. Unlike textbooks -- which can be very dry and safe -- we have dangerous topics, like chocolate, and candy, ninjas, flamingos, pillow forts. It's very engaging, and kids get drawn in.

But more importantly, they're doing it with a dedicated adult; and that offers all kinds of freedom. They can pick as tough or easy a question as they want to work on; they can use any method they want to solve it, instead of following the curriculum; and they can take as long as

they want to journey to the right answer. There's always success at the end of a math problem. And I think that this informs what we can do to get underrepresented groups into the pipeline, because we're turning any parent or caregiver into a playful math guide.

So let's back up for a second -- looking at what I think is kind of a dark truth -- math -- which is the foundation for all the sciences, all the STEM pieces -- is cumulative, it builds on itself. If you cannot add, you cannot multiply yet; and if you can't multiply, you can't learn to divide. So if you think about that, and what we do in our schools every day, it's the realities of our public schools. My mom is a public school teacher here in New Jersey, retired. Whether you're getting adding or not, you're going to be moved on to the next chapter. And the gaps do not get filled in the classroom, because they can't be.

So the opportunity is outside school. So doing some math here -- we're alive about 8,800 hours a year; kids spend 1,200 in school. They spend about 5,000 hours outside school, awake. That is the lever where we can actually enable kids to keep up with what's going on in school; and how kids experience that time is actually what's driving the achievement gap. Wealthy families -- who often are also well-educated -- can sit with their kids, and work on their homework, and fill in the gaps. If they're not academically comfortable, they can hire a tutor.

Low-income kids do not have these options. Sometimes they have only one parent home, or none; or whoever is home is not academically confident, and they certainly don't have money for tutors. If those kids go to school the next day and haven't figured out adding, they will not catch up; they will not get to be part of this pipeline.

I think this is an emergency; because if you look at how to catapult yourself out of poverty, the highest-paying jobs all require really rigorous math and science. They're all in engineering fields, basically. And you can't really go to college, a top school, and major in engineering unless you've done calculus in high school, ideally as a junior, these days. And I can tell you, having majored in Astrophysics at Princeton, that these standards are not arbitrary; you really have to have calculus before you go. And colleges do have to teach at this pace because, in today's specialized fields, that's what it takes to become an innovator. So we can't change that standard; what we have to change is how we get kids to stay in the pipeline so they can make it to calculus.

Luckily, there are resources out there; and we just have to get the word out. So, for instance, Khan Academy has a huge library of videos on every possible narrow topic you could ask for. When they went to an elementary school, they were given the lowest-performing section of 5th graders. They took them back to kindergarten math, and had them just work their way through all the videos, to fill in all the gaps. By the end of the year, those 5th graders were outstripping the rest of their grade, because they actually built the foundation and fixed it.

So as my final point, the question is how do we get this to the parents? Because what this is all about is school connectivity, to empower parents and caregivers to help teachers do what they do in school.

An amazing model out there is the Academic Parent-Teacher Team. It's in 16 States; WestEd did research on it. And what they do is, the first parent-teacher conference of the year is done as a group, with the whole classroom at once. They get all the boilerplate information done in

one shot; that saves so much time that at all the remaining one-on-one conferences during the school year, the teacher can sit with the parent and really talk about where that child has gaps and how to fill those gaps; things they can do at home -- games, manipulatives, videos. It completely changes it, because that's how we have to get kids caught up.

Anyway, there's a lot of wonderful stuff out there; and I am happy to take questions.

Thank you.

ASSEMBLYWOMAN LAMPITT: Well, thank you.

I'm going through your website; I'm having a lot of fun.

(laughter)

Today's question has to do with eggs, everybody.

So it's really engaging -- it really is -- in terms of speaking to the various age groups, making it comfortable for families to be able to utilize it. It's just really something that -- innovative, in terms of trying to make people feel comfortable with math.

And I can't agree more that if a child falls behind and they can't do what they're supposed to do; and too often-- I can only give the example of my brother who, in the 3rd grade, could not read or write, and just kept on being advanced until a teacher said, "Mrs. Rosen, your son can't read or write." But he was a nice kid, so they kept on promoting him.

So if we don't ensure the fact that our kids have the building blocks to be able to move on to the next facet of their learning opportunities, then we are not doing our job, our collective job.

So kudos to you for being so innovative about the approach for making people feel comfortable about math.

MS. OVERDECK: Thank you.

ASSEMBLYWOMAN LAMPITT: Thank you.

ASSEMBLYMAN ZWICKER: I have two questions.

One, of course, is to echo what other people have said. You've been working on this, now, for quite some time. And to say thank you -- that's not a question; that's a statement -- for the efforts that you've done for Bedtime Math, for the ecosystems, for others. It's really made a difference. This is coming out today; but this is -- as you know, since you're in the middle of it -- really the tip of the iceberg of what's going on.

So I do have a two questions. The first one is, if Sally has three flamingoes and two ninjas-- (laughter)

I have a serious question, too.

It was going to be, "How do you work ninjas and flamingoes in--"

ASSEMBLYWOMAN LAMPITT: I was going to give you the egg question; but okay. (laughter)

ASSEMBLYMAN ZWICKER: The egg question? Don't put me on the spot, because I don't want to get it wrong. (laughter)

I want to ask you the same question that I raised before, which is-- What is clear, as this morning has gone on, is that we need to expand, and we need to break down the walls; we need to break the barriers -- not just within our schools, but within the programs that are occurring throughout the state.

And so it is the same sort of open-ended question I want to ask you, which is: How do we partner, how do we do this, how does-- We've heard about industry partners, foundation partners, public partners, the

school systems. What's your take on how we expand this? Because I strongly agree with your statement you said at the end, is that this -- *emergency*, maybe, is too strong a word. But, I mean, every day that we don't expand, someone is getting left behind; and that's a tragedy.

So what are your thoughts on this?

MS. OVERDECK: I think-- Well, I think it's been talked about -- the connectivity between groups, when-- There are towns where a lot of kids leave school and go together to aftercare for three or four hours. There's a huge opportunity there to communicate with the school about what they were doing that day in school; and then use the freedom and playfulness of the after-school program to reinforce that.

I don't see a lot of those conversations going on. The ecosystems have been fabulous, precisely because they are starting to make some of that happen.

The issues with partners-- Liberty Science Center -- for full disclosure, I'm on their Board -- they do work with school districts. But it's hard, in our state, to just get across the state -- even though we're kind of small -- and a lot of fabulous things are going on that have a local hub. And how do you get that to everybody? Not easily; and that's where replicating becomes important. So Students 2 Science is in a couple places now; I totally agree -- we should be looking at how to put one of those in every county, because then you can have every school work with Students 2 Science.

ASSEMBLYMAN ZWICKER: Thank you.

ASSEMBLYWOMAN JASEY: I just want to thank you.

I think we met four or five years ago--

MS. OVERDECK: Yes.

ASSEMBLYWOMAN JASEY: --and your work is -- it was exceptional then, and it's even more so now. And my two older grandchildren love the program. (laughter)

MS. OVERDECK: That's great to hear; thank you.

ASSEMBLYWOMAN DiMASO: I think it's interesting how you even came up with that thought and the app. I mean--

ASSEMBLYWOMAN JASEY: She's a mom. (laughter)

MS. OVERDECK: I should-- Yes, the real credit goes to my kids.

ASSEMBLYWOMAN DiMASO: I said it was very smart, then I heard that you went to-- You're an astroscientist from Princeton; I'm, like, "Well, she is very smart."

So thank you for sharing. You actually gave me chills during your presentation, so thank you for that.

MS. OVERDECK: Oh, thank you

ASSEMBLYMAN ZWICKER: Thank you.

MS. OVERDECK: Thanks for having me.

ASSEMBLYMAN ZWICKER: Next is Al Murray, Executive Director, New Jersey Agriculture Society, Learning Through Gardening.

**A L M U R R A Y:** Good morning.

ASSEMBLYWOMAN LAMPITT: Good afternoon. (laughter)

MR. MURRAY: As introduced, my name is Al Murray; I serve as Executive Director of the New Jersey Agricultural Society.

My daughter is a proud graduate of The College of New Jersey, and she majored in Math, and Science, and Technology; and she's currently

a teacher over in Ewing, teaching math. So this school has done wonders -- was wonderful for her; it was a great experience. When I think of how much of my money went into building this building-- (laughter)

Well, one of the things that I was listening to the speaker's talk about -- how important it is to educate and to introduce STEM to students at a young age. This is a perfect segue into what I'd like to talk about.

As stated, I'm the Executive Director of the New Jersey Agricultural Society. Just as way of background, the Agricultural Society was founded in 1781; we're one of the oldest organizations in the United States. We're nonprofit, we're membership-based; and our mission is basically to educate the New Jersey public, and all the public, about New Jersey's third largest industry, which, of course, is agriculture.

And we can only do that through three programs. We have a Farmers Against Hunger program, where we work with farmers, and we glean the fields, and we feed about 7,000 citizens every week.

We also have an Agricultural Leadership Program, where we identify up-and-coming agriculturalists and help them become future leaders in the industry.

And then the program that I'm here to talk about today, the Learning Through Gardening program. This particular program is headed up by a staff person -- her name is Carolyn Taylor -- she's a former teacher; and in the 10 years that she's been running this program, she has just done a fabulous job.

The idea of Learning Through Gardening basically provides New Jersey elementary schools with financial, educational and agricultural resources to create a school garden that is used as a learning laboratory.

Teachers are encouraged to use the school garden to teach their standard curriculum -- including math, science, technology, engineering -- and the students have the opportunity to learn how healthy nutritious foods are produced; why it's important to include fresh fruits and vegetables in their diet; and also there's some science about not only just growing, but also environmental concerns and things like that.

The goals of our program are to teach children where their food comes from, and give them the experience of growing their own food. We also encourage the children to include more fruits and vegetables in their diet, because they're eating the fruits and vegetables that they are producing as a result of their own labor.

And of course, it gives the teachers an outdoor garden classroom, where they can teach everyday curriculum on all the subjects that we just mentioned.

Schools that participate -- what we do is, for the Agricultural Society, we actually supply the schools with the materials to build a garden, including the raised beds, soil, child-sized hand tools, hoses, composting bins. We provide the vegetable seedlings and seeds for three growing seasons each year, for a fall, spring, and a summer garden program. We provide a kickoff rally at the school when they are accepted into having this program. We also do an introductory gardening teaching workshop; so we're not just throwing the teachers out there to try to figure it out.

We also provide lesson plans to coordinate outdoor gardening experiences with the everyday curriculum in math, science, social studies, and the arts. And, right now, we have about 85 lesson plans that are available for teachers. And it's very easy for our teachers; they can go on

our website. Our website has a whole list of different -- and I'll pass this around when we're done -- but, for instance, basic gardening lesson plans; making mud shakes to learn about the soil. They can click on that, and they can download the lesson plan.

Teaching science in the garden: making biodegradable plastic from corn; measuring wind speed. Again, they go right on to the website; they click it, and it gets downloaded.

Teaching math in the garden: discovering an acre; you are the ruler -- measuring in the garden; like I said, we have 85 of these.

So we make it pretty turnkey and easy for the teachers, because we know they have a lot of activities that -- again, trying to make it as simple as we can for them.

Because the school year basically encompasses a lot of the wintertime -- which isn't conducive to growing outdoors -- we also provide indoor lesson plans. Just last month I was at a school, and they were growing rice paddies in a bucket; which not only showed them how to grow something, but they also learned about the importance of rice and what it is, basically, to our world population.

We have a best practices workshop every year, where we introduce teachers into the program and what they need to do. And again, we provide seeds and supplies for the indoor lessons.

Currently, our program is in 40 -- I'm sorry, 51 schools. We just recently welcomed Camden, East Orange, Newark, and Trenton; and I have a list of the schools which I'll, again, pass around.

So you can see we do focus towards an inner city with this, because we feel that that's where agriculture -- there's a lack of education in that particular thing. And again, it teaches kids how to grow.

So why a school garden? A school garden is often the child's first connection to agriculture. The school garden shows children where their food comes from -- milk doesn't come from a container, corn doesn't come from a can. And it also teaches them that agriculture is vital to everybody. The research that has been provided to us -- we find that when the children are involved in a school garden, they tend to eat more fresh fruits and vegetables. And gardening increases their interest and improves their attitudes toward healthy eating.

The school garden takes kids outdoors; gets some away from their video games. It shows them that it's a real life, physical activity in the fresh air; and they're learning in a unique environment, instead of the traditional classroom where, you know, it gets a little boring in there. They're outside. And sometimes they don't even know they're learning, just through the activities that they're having. Yes; trying to get the kid to eat the beets, and actually make them like them, right? (laughter)

Gardening also teaches children -- not just through the gardening part -- but also, like I said, the environmental concerns too. They learn the importance of what agriculture is to this state and how agriculture affects them. And also they learn a lot about the different sciences and stuff.

I had a 33-year career with the Department of Agriculture. And you know, sometimes people look at farmers, and they get that Norman Rockwell image where they're on a tractor and, you know-- They don't

realize they have to be scientists, they have to be mathematicians; the technology changes. And it's such a science-based industry; and this is an opportunity for children to learn in a fun and educational manner.

And I'm glad I was able to have the opportunity to introduce you to this program that we proudly sponsor.

ASSEMBLYMAN ZWICKER: Thank you.

I just wanted to say thank you; and emphasize something you said at the end -- which is, the technology of agriculture and the technology of farming is changing dramatically; and ways to increase crop yields, or to be more efficient with water use.

MR. MURRAY: Oh, yes.

ASSEMBLYMAN ZWICKER: You're the expert, but there are so many wonderful ways to work math and science into simply growing a soybean, or whatever it might be. It's a great connection.

So thank you.

MR. MURRAY: I look at it-- Like, when I saw that rice bucket, the first thing I thought of was Norman Borlaug who, of course, is credited with -- Nobel Peace Prize -- saving the world; or saving at least a billion people through the advances to agriculture. And in the sector of the agricultural industry -- this is nationwide, not just in New Jersey -- but technology is the fastest-growing sector in that. And there are just multiple jobs that are expanding for students someday to get involved in that field.

ASSEMBLYWOMAN LAMPITT: I can't thank you enough.

I think it's the old proverb; you know, you give a man a fish, they eat for a day. If you teach a man to fish, they can -- or girls -- they can eat for a lifetime.

But certainly, exposing young people into agriculture, you know, exposing them to, you know, the aspects of the reward when you put in the seedling, and then you can actually pick it from a plant and actually consume it, really inspires them to be healthier and to understand how agriculture is just so vital to the importance of New Jersey, as well as the world.

Why is it only in 51 schools?

MR. MURRAY: Well, we're a small organization; quite frankly, I'm almost embarrassed to say, but our budget for that is about \$60,000 a year. So we can only do five schools a year.

We're, like I said, membership-based. As a matter of fact, like your last speaker, I also have to cut out of here; because we have our largest fundraising event on Saturday, our gala, which I'm in charge of.

ASSEMBLYWOMAN LAMPITT: Very exciting.

Thank you very much; we appreciate you coming.

ASSEMBLYMAN ZWICKER: Thank you.

ASSEMBLYWOMAN LAMPITT: Our last two speakers are Vani Kodandaram and Bahar Demirdirek, from Bristol-Myers Squibb.

Welcome; good afternoon.

**VANI KODANDARAM, Ph.D.:** Thank you.

**BAHAR DEMIRDIREK, Ph.D.:** Thank you.

Good afternoon, Chairman Zwicker, Chairwoman Lampitt, and the members of this Joint Committee.

It's an honor to take part in today's Committee meeting.

My name is Bahar Demirdirek; and I am a minority who received the first Ph.D. degree in my family.

But much more, I am a chemist by training -- Rutgers alumna -- and mentor of many students in STEM fields.

I have the pleasure of serving as a global oncology regulatory coordinator at Bristol-Myers Squibb. Bristol-Myers Squibb is a global biopharmaceutical company, dedicated to discovering, developing, and delivering transformational medicines for patients. Our medicines are helping millions of patients around the world in disease areas, such as oncology, cardiovascular, fibrosis, and immunosciences.

Moreover, we are helping to support our communities where our employees live and work. Bristol-Myers Squibb has more than 6,000 employees in New Jersey; and it strongly focuses on increasing opportunities for women and minority students in STEM in New Jersey.

Given the key role that innovation plays in helping patients, it is critical for us that we foster a culture at Bristol-Myers Squibb where new ideas are welcome; where diversity of talk pushes us to think beyond the statistical.

We have all seen the undeniable business value of diversity and inclusion through our experiences, as well as in countless academic studies. However, when it comes to diversity, I think you will agree that more can be done to foster environments and develop future talents in STEM.

Our organization is built by biologists, chemists, engineers, computer scientists, statisticians, and mathematicians, and many more talented employees with a STEM degree. Achieving diversity in STEM fields is very important to us to bring forward medicine that transforms patients' lives.

Bristol-Myers Squibb is committed to helping create a STEM workforce, which is diversity inclusive. And I'm proud to say that we have created eight affinity groups. Some to highlight: Bristol-Myers Squibb Network of Women, Black Organization for Leadership, Hispanic Affinity Group, and Asian Network. These affinity groups are helping to not only drive engagement and develop diverse leaders within Bristol-Myers Squibb; they are also increasing opportunities for and encouraging the development of women and minority students in STEM fields across all levels of education.

We are here as representatives and champions of Bristol-Myers Squibb's Network of Women; we have a strong focus on women in STEM, as there is a need here.

And now I would like to hand it over to my colleague, Vani Kodandaram, to share our external STEM engagements.

DR. KODANDARAM: Thanks, Bahar.

Good afternoon.

It's an honor to be here as part of this Committee today.

And I'm actually very proud and happy to share-- I have two boys, both of them chose to stay in state; so one is graduating from the Mario School of Pharmacy; and the other one NJIT and the Rutgers Medical School.

As a graduate of Computer Science, I graduated from NJIT too. I actually have a personal goal to promote women in STEM; and I've been very fortunate, as an employee of Bristol-Myers Squibb, to be part of the BMS ecosystem committed to helping build the STEM workforce of the future that's diverse and inclusive.

Our goals as a company are to enhance STEM education, energize students -- especially who are at a crossroads -- right here in our New Jersey communities; and we're doing this at different levels.

The first one: With our goal to improve STEM education in communities where our employees work and live, we are starting with supporting the educators. The Bristol-Myers Centers for Science Teaching and Learning, which are located at Rider and Montclair State University -- which were opened in 2001, through a grant from the BMS Foundation -- are working with school districts across the state to create and deliver the Next Generation Science Standards, which is influencing thousands of students across the state.

We're helping middle school and high school students through our partnership with organizations and public schools in Mercer, Middlesex, and in counties across New Jersey -- like the Boys and Girls Club, 4-H, Girl Scouts, Students 2 Science, FIRST Robotics -- all through a grant of New Jersey Giving. So over the last five years we've invested over \$2 million in supplementing after-school, weekend, and summer camps.

And at the graduate level, we fund summer programs for undergraduate students at TCNJ, Rider, Monmouth University; and also Mercer and Middlesex County Colleges. Through these programs our students gain experience that is invaluable to them; not only for employment, but if they want to continue further studies.

We realize the importance of STEM mentors; and I'm very happy to say I was part of the Douglass partnership with Douglass College, where we have students who have BMS as mentors. And the advantage -- I think we were speaking about this before -- is they can see people like

themselves who are in STEM careers. And especially, women encouraging women is extremely important.

Science, technology, engineering, and math are at the core of everything that we do at BMS. We're committed to STEM education, to inspire students; and we believe that they have a career in STEM, moving ahead.

I do you want to say thank you, Assemblywoman Lampitt, for your continued support for education; and also for finding a cure for patients.

Thank you to Assemblyman Zwicker for his push to pass the legislation to establish a STEM loan redemption program.

Thanks to all our legislators, and the Governor, for re-establishing the New Jersey Commission on Science, Innovation, and Technology; our Governor, for establishing the Office of STEM within the New Jersey Department of Education.

We ask for continued support from our government to promote and fund the current programs; and continue to collaborate with the state's employers and educators.

Students need more opportunities to explore STEM subjects so their interests are sparked at an early age. And I think we heard from the other speakers; and from what we've looked at, I think the early age is extremely important.

We ask that you continue to promote women and minorities in STEM programs that facilitate career development, education, networking, leadership, and entrepreneurial opportunities.

Thank you for inviting us. We are committed to developing and empowering women and minority students in STEM fields.

Thank you.

ASSEMBLYMAN ZWICKER: Thank you.

ASSEMBLYWOMAN LAMPITT: I just have a quick question.

Does New Jersey -- you may or may not know -- but does New Jersey have enough Ph.D. programs that continue the pathway for individuals to continue into STEM initiatives within a Ph.D. level?

DR. DEMIRDIREK: I don't have the right answer for that; but I know there's a program called *iJOBS*, organized by Rutgers and funded by NIH -- and that is more focused on the Ph.D. and the post-doc level in the STEM fields. And we are also partnering with them.

ASSEMBLYWOMAN LAMPITT: Okay; thank you.

ASSEMBLYMAN ZWICKER: I just want to say thank you.

BMS is a critical part of New Jersey's Life Sciences ecosystem overall. And the work the Foundation has been doing now for, it seems, multiple decades has made an enormous, enormous impact. And it's clear, again, from this hearing, that BMS, as a piece of this ecosystem, is critically important to what we're working towards.

So thank you, to you both.

If there are questions--

ASSEMBLYWOMAN LAMPITT: Anybody else?

ASSEMBLYMAN ZWICKER: --or comments before we wrap it up?

ASSEMBLYWOMAN JONES: I would just love to say thank you. (laughter)

DR. DEMIRDIREK: You're welcome.

ASSEMBLYWOMAN JONES: And, you know, a little aside here.

I mentioned to Assemblywoman Mosquera that -- why aren't we doing more programs with Boy Scouts and Girl Scouts to develop that? And here I see (leafing through brochure) Bristol-Myers Squibb and others -- Rutgers, and the 4-H Clubs -- how important -- and Rutgers Agriculture.

So we all-- It takes a village, right? So we all need to get our hands in and work on this with our kids. Because getting them excited about these things is how we get people like you, professionals, who are going to make our lives better.

DR. DEMIRDIREK: Thank you.

ASSEMBLYWOMAN DiMASO: I'd also like to compliment you on that programming. And if, through the Chairs, you can send us next year's dates, that would be great; because then we could share it with our local 4-Hs, and the Girls Scouts and the Boy Scouts.

That would be -- we would love to do that.

DR. KODANDARAM: Thank you so much for that.

I think we started that six years ago; and that's one of the programs that personally we are very satisfied with. Because we have students who not only graduate from the program, but they've gone on to become 4-H -- either STEM ambassadors; or they come back to the program to support it. So it's something that we're very, very proud about -- to support -- and we want to continue growing it.

ASSEMBLYWOMAN DiMASO: Thank you.

ASSEMBLYWOMAN LAMPITT: Thank you.

And just in closing, to everybody who attended today -- I learned a lot. I feel like-- I've been a New Jersey Legislator for almost 14 years, and I'm always surprised by-- the more that I continue to learn, to know about the great collaborative effort that we actually do here in New Jersey.

ASSEMBLYWOMAN JONES: I'll probably miss that the most about the Legislature -- is the fact that every day I go to work and learn.

ASSEMBLYWOMAN LAMPITT: So it's wonderful.

So thank you all. We know it was a rainy day; but I think it was a great opportunity for all of us to collaborate, and share, and knock down some silos. That's the next thing we're going to do.

ASSEMBLYMAN ZWICKER: And I have a comment; but before I do, Vice Chair Kennedy has--

ASSEMBLYMAN KENNEDY: Sure.

I would like to thank all the participants today -- I think this was very informative and helpful to us; and also the two Chairs, who helped put this together -- I think you did a great job.

ASSEMBLYMAN ZWICKER: Thank you.

ASSEMBLYWOMAN DiMASO: If it's okay, I'd like to echo those words.

Thank you both for putting this together. I'm glad that I made the trip.

And thank you for bringing up the arts. I think STEM and STEAM together -- if we can, you know-- I often say, we all know our conjunctions, thanks to the *Conjunction Junction* song. (laughter)

ASSEMBLYMAN ZWICKER: What's our function? (laughter)

ASSEMBLYWOMAN DiMASO: It's a great way to learn, so I thank you for that.

And thank you all for coming. A lot of you gave me chills in your presentations.

ASSEMBLYMAN ZWICKER: We ask ourselves that all the time, by the way. (laughter)

I just want to say thank you to The College of New Jersey for hosting us. It was really important for us to do this in an academic environment, in the STEM building that we're in.

I want to thank both -- there's a lot of effort that goes into making that happen -- to the staff, both the partisan and nonpartisan staff, that ensured that this happened; that everything goes into the record.

To both Committees; I'm fortunate enough to serve on both. It is really about science and education combined. So thank you, Chairwoman Lampitt; it's really been a pleasure to combine today, as we've done.

And I think to tackle what you said, you know, we heard today science is really about failure, in so many different ways, and how you respond to failure, and how you learn from it, and how you move on from it, how you make the next great discovery.

But today we heard about great successes happening from all across our state. And I just want to echo what Chairwoman Lampitt said -- it is about how we can break down these silos, how we can expand the tremendous work that everyone today showed that we're doing, and how we can work together. So it's about what we can do moving forward.

So thank you to everybody; and with that, macaroons are served. (laughter)

**(MEETING CONCLUDED)**