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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (AAAS)

CONFERENCE 1 OF 4

PLENARY 1: THE FUTURE OUTLOOK FOR TEACHING AND LEARNING BEYOND COVID

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(Music.)

>> Good evening. Good evening. Please take a moment to find your seats. Hurry, hurry, there's plenty of spots over on this side.

Greetings, it is my extreme pleasure to welcome you to the official start of our 2022 IUSE summit. It's a true pleasure to see you here in person. It's a true pleasure to welcome you here and in our nation's capital.

My name is Travis York. I serve as the director of ISEED at AAAS. It stands for Inclusive STEM Ecosystems for Equity and Diversity, and it's the program unit that houses programs like IUSE, Noise, or HPCU makers and also lots of other programs that directly benefit scientists across the STEM multidisciplinary -- that are multidisciplinary. You say disciplinary twice there including our L'Oreal fellows, our Mason Award winners and our other groups like that.

Today I'm particularly excited about joining you here and getting to network with you -- to network with you for the next few days. As we're joining, because of the size of our group, we do encourage you to please wear masks as you feel comfortable. There isn't currently a mask mandate here in DC.

We'll follow DC guidance across the conference. But if you feel comfortable, please feel free to wear one, and we would like masks to be the norm. If somebody asks you to mask near them because they are immunocompromised or someone they live with is, we ask to you respect their wishes. We're excited to gather with you, and we want to make sure we can do that in as safe a way as possible.

And I want to also start today with a quick introduction to our unit, but first I would like to provide a land acknowledgement. For those of you that may be unfamiliar a land acknowledgement means beginning a gathering by naming the traditional Native inhabitants of the land in order to offer recognition and respect to Native Peoples and to cultivate a deeper awareness of the history

that has led to the present moment.

As the son of a proud half Choctaw, quarter Cherokee man, it is important to me that I help make the invisible, visible.

We wish to gratefully acknowledge all the diverse and vibrant indigenous peoples on whose ancestral homes many of us live and work. Today we acknowledge we're on the lands of the indigenous Piscataway and Anacostian peoples, and we pay our respects to the elders past and present.

At AAAS, our inclusive STEM ecosystems for equity or diversity or ICT seeks to re-imagine and reconstruct the continuum of education and career development to achieve a just equitable and inclusive STEM enterprise that leverages diversity to advance science and to serve society. The AAAS IUSE initiative and the IUSE community are at the core of this work. The PIs, co-PIs and other STEM professionals at this conference work tirelessly conducting research, developing strategies and methods for increasing the uptake of strategies that will improve the way we teach and learn STEM for everyone's benefit. We are grateful to each of you for your contributions to our IUSE community.

We're also grateful to our IUSE advisory board. These members offer their time and expertise to help our team provide meaningful activities and resources. We hope that this conference gives you a platform to share your amazing work as well as learn from your fellow IUSE awardees.

Over the next 2.5 days, you will meet IUSE awardees who are

re-imagining the tools, resources, and methods for STEM. Many are researching organizational change processes that examine broader systems and institutions that impact our undergraduate STEM education. And many are examining diversity, equity and inclusion and accessibility efforts, so that we can create future STEM environments where all students, regardless of their backgrounds, race, gender, disability status, location or income level, have a chance to succeed in STEM.

I hope that the next few days provide you with the opportunity to reflect on your learning in relation to your institutions, your departments, your fellow faculty members, your classrooms, your students and yourself. Together, we cannot not only imagine, but we can enact a just, equitable and inclusive STEM enterprise that will serve society in meeting its grand challenges.

And now it's my very great pleasure to introduce Dr. Sudip Parikh, who became the 19th chief executive officer of the American Association for the Advancement of Science or AAAS and executive publisher of the Science Family of Journals in January 2020. Dr. Parikh has spent two decades at the nexus of science, policy, and business, and he previously served as the senior vice president and managing director for DIA America along with previously serving as the vice president and general manager of health and consumer solutions at Battelle, leading its healthcare improvement, public health research and consumer industrial and medical technology development teams in R & D.

Dr. Parikh is a board member of Research America, the Friends of Cancer America and the Food Innovation Center. He was a presidential management fellow at the National Institutes of Health Centers and awarded a national foundation grant fellowship while earning his doctorate. He earned his science degrees in materials applied science from the University North Carolina at Chapel Hill.

You'll hear that Chapel Hill drawl come out as he speaks.

And earned his doctorate of philosophy degree in chemistry from the Scripps Research Institute.

Please join me in welcoming him.

(Applause.)

>> Thank you, Travis, and thanks, everybody. It's a Hickory drawl. Chapel Hill has a very different drawl.

First of all, it's my job to officially welcome you on behalf of the AAAS which I'm going to do now. Consider yourself officially welcomed on behalf of the AAAS.

(Applause.)

>> That's right. It's great to see everybody in person. This is -- this is -- this is wild to me. It's been a long time since I've seen this many wonderful people in a room together, so that part is incredibly exciting.

I was told a long time ago by a mentor that if you are given the privilege of speaking before a group of people who are about to do important things, then you have a responsibility, you have a duty, to be profound because you're taking up their time. You're taking

up their time. And if you can't be profound, then you'd better be informative 'cause again you're taking up their time. You better inform them of something -- work they're about to do.

And if you can't be profound, and we if you can't be informative, then you better darn well be brief, and so I'm going to try to be -- I'm going to be brief today. I'm going to be brief. Profound is tough, informative is tough enough. I'm going to try to be brief.

Look, the AAAS, the American Association for the Advancement of Science, is 175 years old. It's 175 years old, and it was formed in 1848 in Philadelphia by a group of scientists. They're mostly naturalists at the time, geologists, the precursors of meteorologists, and we they were all white men, and they were radicals for their time, terribly progressive for their time, but they were of the scientific enterprise at that time. They were all -- all white men.

And what's happened over the course of the last 175 years is profound systemic change. Let me talk about that a little bit. Over the years the organization has evolve, and it's always tried to be one step ahead of creating the best possible scientific enterprise to fulfill its mission, which is to advance science and serve society.

And what we found in seeking out that mission is that scientific excellence and diversity and inclusion are inextricably linked. They are inextricably linked because what happens is, if you don't have diversity of thought -- diversity of thought and diversity of

experience you don't have a wide-enough aperture to do great science, so never let anyone tell you that there is a balance between these two things. In fact, they are inextricably linked. They build upon each other, and they make the world a better place together.

You know, we've been -- we've been working on this a long time and what's happened now is -- if you look at the board of the AAAS, you'll find that it's a majority of women. You'll find in terms of its demographics it looks like America. It looks like America, and that is without any -- any compromise without the scientific excellence we still have Nobel Prize winners and the winners of national economies they just happen to be women, they just happen to be black, they just happen to be Hispanic, and it happens over time, and it's led to the place where they are at the forefront, at the forefront of leading the in making this inextricably link of scientific excellence and the diversity of thought.

And I get letters -- I get letters that attack our commitment to this because we are an organization that represents the entire scientific enterprise. And what they'll say is things like: Gender plays no role in meritocracies or that race doesn't have a basis in scientific -- in scientific thinking, and, you know, what I say, in fact, is that patriarchy and racism are social constructs. They are social constructs that can't be ignored. They can't be ignored because they are here. They are a fact of life, and so what we have to do is we have to -- we have to actively -- actively attack these problems.

And what that means is exactly what you all do: Which is to incorporate -- incorporate and try to change the system by your teaching of undergraduate students. When you teach an undergraduate student when you're reaching an undergraduate student when you change the undergraduate student, you're changing the scientific enterprise and that student, even if they're not the ones that do the -- that do the research that changes the world, they're their student may be the one that changes the world. Their colleague may be because they've had the diversity of thought in the room with them, in the room with them.

So I am in awe of each and every one of the work you do because it's not easy. I have a 17-year-old son, and I know that in the best of circumstances it's not easy. It's not easy, but what I -- what I know what I know in the principal investigators of our IUSE program of our work in ISEED of the work we do through the SEA Change program at institutions that there is a cohort of scientists early career scientists and engineers that you are educated that give me hope because sometimes -- this is not a great time to be an optimist and the only thing -- the only thing that gives me that optimism on a daily basis to go to Capitol Hill to go talk to our leaders I didn't use air quotes to talk to our leaders is the fact that I am confident -- I am confident that the students that you are teaching, the students that you are changing, the students that are creating and the scientists that you are creating are going to change the world.

Thank you for being here. Thank you for your -- just incredible energy that you bring to this endeavor and thank you for making the IUSE program what it is and what it can be, and I look forward to meeting each and every one of you. Thank you.

(Applause.)

>> We're very fortunate to have this -- this gathering funded through the National Science Foundation. We're very thankful for our partners at NFS and the many program officers that made themselves available today and that will be joining us for the next couple of days.

We also have a brief welcome video from Sylvia Butterfield, the acting assistant director in the -- in the directorate of education and human resources at the National Science Foundation, and that should be playing any moment.

>> Good evening, everyone. I'm Sylvia Butterfield, acting assistant director for education and human resources thank you National Science Foundation.

Now I'd like to welcome you to the undergraduate STEM principal investigative summit. I'm pleased to join you virtually for what I'm sure will be an exciting and engaging meeting.

And on that note, I want to thank my colleagues and all the organizers for your hard work in putting this event together. I'm told we have over 600 attendees and all of you have been doing such great research. I cannot overstate the importance of your work for students, educators and the nation. I understand that during the

next 3 days you will have many opportunities to learn from one another as you showcase the work you're conducting through a series of poster sessions, working sessions and panel discussions. It is our hope that your dialog and collaboration will allow you to develop and enhance your projects and ideas that will have a broader impact on STEM education, both in the immediate future and in years to come.

And what a fitting theme to engage in discussion with your peers. Propelling change, moving from strategy toward effective and equitable undergraduate STEM education. This theme fits squarely within our goals at the National Science Foundation and the doctorate of education and human resources. We strive to provide both learning tools and learning environments that are accessible and equitable for researchers, educators and students of all ages.

Now, I'm pleased to speak with you about the National Science Foundation's role as it relates to STEM education and IUSE. Our mission at NFS is to promote the progress of science to advance the national health, prosperity and welfare to secure the national defense, promoting research on best practices in STEM education and empowering instructors to use the results of that research to improve STEM teaching and learning is one critical way for NFS to accomplish its mission.

NFS's investment in STEM education dates back to the agency's authorizing language and has been reinforced over the past 72 years. The foundation is the only federal agency that supports fundamental STEM research and education across all fields of science and

engineering. To sustain U.S. leadership in excellence in STEM and to meet the high technology workforce needs of today and tomorrow, the U.S. must maintain a vigorous investment in its STEM human capital. IUSE is helping us to do just that by improving the quality and effectiveness of undergraduate education in all STEM fields. Investments through this flagship program enable NFS to lead national progress toward a diverse and innovative workforce in a STEM-literate public. It is because of you that progress in STEM undergraduate education is possible.

It's great to see how the program has transformed over the years to meet the changing needs of students and educators. This includes addressing the shift to remote learning that we all experienced at the highest the pandemic -- height of the pandemic. For example, IUSE provided extensive support for exploring online and virtual learning including funding a series of rapid awards that were made at the start of a pandemic. This funding provided many tools that enabled institutions to pivot to online instructions and to continue educating their students from afar.

Nearly 10 years' ago, NFS started the IUSE to address a twofold problem: 1, to improve STEM undergraduate education so U.S. learners could become stronger leaders; and 2, to broaden participation of groups that historically that have been underrepresented in STEM. This came in response to concern from the private sector, government and academia that undergraduates earning STEM degrees would not be prepared to lead in edge mooving STEM areas.

Clearly, IUSE is work to address this national call by taking steps to reduce barriers to entry in STEM and by improving STEM education.

Since its founding, IUSE has funded nearly 2,000 awards in a span of variety of disciplinary and inner disciplinary work including teacher preparation and projects rooted in expanding diversity, equity and inclusion. Until can, the program has more than 900 active awards.

This program has supported PIs and students at diverse institutions around the country, at college universities in every state, the District of Columbia, Puerto Rico and the --

(Inaudible.)

>> U.S. Virgin Islands.

As broadening participation continues to be a major factor at -- focus at NFS, I'm so excited to see the IUSE portfolio expand to support more institutions and projects.

As you know the goals of the program remain focused on improving STEM learning and learning environments, broadening participation and building the STEM workforce of tomorrow, and I'm proud to see IUSE efforts stretch across the foundation to help meet these goals and programs such as IUSE red where projects are designing revolutionary new approaches to engineering education.

IUSE Geocast, which is forming STEM learning ecosystems which engage students in the study of earth, ocean's polar regions and the atmosphere.

IUSE 2, which re-envision house to teach computing effectively

to a broad group of students.

IUSE HSI which improves projects for student STEM institutions at Hispanic student institutions and NFS continues to make a substantial commitment to undergraduate STEM education.

And as IUSE PIs, you're advancing STEM knowledge, helping us adapt, improve and incorporate evidence-based practices in STEM teaching and learning.

To date, IUSE awards have helped improve diversity in STEM education, promote collaborative research and development and ensure all undergraduate students are fully engaged in their STEM learning.

For example, at Texas University San Marcos, IUSE funded a project to retain students and to increase support and encourage female Hispanic and African-American undergraduate students in STEM. At Bowling Green State University and Owen State Community College. They worked together using IUSE funds to increase students success in STEM undergraduate education by improving quantitative competence and logical reasoning skills.

Researchers at the University of Colorado at Denver, North Dakota State University Fargo and Florida International University investigated how learning methods and learning assistance support -- to learning achievement, retention and persistence for thousands of STEM students.

And the College of William and Mary is empowering geoscience faculty IUSE by creating professional development -- a professional development project that will build a national network of two-year

college faculty who use evidence-based strategies to improve student success in STEM.

As we celebrate nearly 10 years of IUSE and reflect on the impact of the program, we also look ahead to the future where we envision furthering our efforts in STEM education at community colleges. We plan to examine the continued impact of the program, particularly awards made to encourage institutional and community transformation.

And we hope to expand efforts in institutional transformation at more schools. Clearly, we couldn't make this progress in STEM without PIs like you. You generate the innovative teaching practices and programs that has advance STEM education, prepare the next generation of STEM professionals and help us broaden participation in STEM.

Thank you for joining us at this summit. We at NFS appreciate your hard work to improve STEM education for undergraduate students, and we look forward to your presentations during this IUSE event. (Applause.)

>> Well, I hope you're feeling sufficiently welcomed. And if not, please let me know, and we'll see what we can do about that in case there's any issues.

As we think about really propelling change and moving from strategy towards effective and equitable undergraduate STEM education, we're joined Thursday evening for our first and opening plenary by 3 incredible scholars and leaders in higher education. I'm very excited to introduce you to our keynote and panel that will

follow the keynote.

If you are, you know, a Tweeter-er or a person who likes to snap some Instagram pictures and the such, we would encourage you to please tag us. We'd love to see your lessons learned, the stories from this -- from the next several days the Twitter credentials are up on the screen you can tag us at IUSE program, and we would love for you to use the #Ilovesinsights in the colearning in our social media insights and thank you in Whova this is our first time within ISEED.

With COVID, we thought you could maneuver that as well. I heard of all the friendly competition on that leader board so keep up the good work and thank you.

Our keynote for this evening is from Dr. Catherine Manduca, or Cathy as you got know her. She has 2 years to improve geoscience education in undergraduate STEM education. She is the director of the Science Education Research Center or SERC at Carlton College. This work supports communities of educators in learning together and collaborating to create resources, supporting widespread improvement.

The 30,000-plus pages comprising the SERC websites are visited by 5 million visitors per year. Dr. Manduca's research focused on focusing on faculty learning, and we educational practice. She was the executive director of the national Association of Geoscience teachers from 2007 to 2019.

She serves on the board of science education at the LabX advisory

board for the National Academies of Science, engineering and medicine and has served on the elected leadership for the American Geophysical Union and AAAS education section in the past.

She's a fellow of the AAAS and Geological Society of America and past recipient of the American Geophysical Union award for excellence in earth and space education.

She received her BA in geology from Williams College and her PhD in geology from the California Institute of Technology.

After Cathy's keynote, she will be joining the next two guests I'm happy to introduce to you for more of a panel Fireside Chat. You can be thinking about your questions throughout all which we'll be collating, and then providing during a Q & A portion.

So first to join is Dr. Tonya Peeples, who is the associate dean for diversity and outreach and a professor of chemical and biochemical engineering at the University of Penn State's College of engineering. She has made a strong impact on the college's faculty recruitment process and increased the number of women and underrepresented minority students pursuing engineering education and engineering majors, both at the undergraduate and graduate levels. Dr. Peeples and her team scaled up regionally and across the state. In addition, she's currently the director of the ethnic inclusion effort for engineering and associate director at the center for biocast and bioprocessing. She received her Bachelor of Science in chemical engineering from North Carolina State University and a doctorate in chemical engineering from John Hopkins university and

is a member of the American Association of engineering educators, society of women engineers national, so I have the black engineers, national association for the professional advancement of black chemists, and we chemical engineers and the American Institute of Chemical Engineers and we American Chemical Society. I'm sure we missed a couple. Right?

And rounding out this all-star cast is Dr. Abdimalik Buul, who's currently serving -- serving a two-year visiting executive -- excuse me, currently serving a two-year visiting executive of educational excellence role at the California community college chancellor's office.

During his tenure, he will assist in ensuring equal employment opportunities and initiatives that are connected to the classroom.

He's an award-winning professor, antiracist activist and emancipatory educator.

He's involved -- he is an innovative, dynamic leader within the San Diego community and throughout the state of California. He completed his bachelor's degree in sociology and a master's degree both from San Diego State University.

He completed his doctorate work in educational leadership with an emphasis in educational society from the University Southern California.

Dr. Buul is an electrical engineer at SDO where he talks to students in the advanced certificate and mental health recovery and trauma in education with a concentration in counseling programs.

He serves as cochair for the California community colleges or AAAS CCS, the equity diversity action community and oversees over \$20 million, budgeted over 116 colleges making it the largest system of higher education.

Please join me in welcoming this illustrative panel.

(Applause.)

>> Okay, can you hear me?

So now I know I can't live up to my introduction, and I need to be either profound or informative or brief, and I've been asked to talk for 30 minutes so --

(Laugh.)

>> Anyway, it's so nice to be here. It's wonderful to see all your faces attached to your bodies, and it really feels like a moment of -- what I would call inflexion.

I've been asked to talk about the future outlook teaching and learning beyond COVID, and I guess I don't -- I'm not convinced that we're -- we are or ever will be beyond COVID.

But I do really feel like we're a moment of inflection, and I feel the hope of that and being with everybody in a room is a big part of that so one of my mentors -- well, mentors are helpful this morning and always on Thursday evening and always tell me that when you're at a moment of inflexion -- I don't know, maybe this is one like this, but she was talking, and I was like everyone like this --

(Laughing.)

>> But when you're at a moment of inflexion it's really important

to think about what you have learned to reflect on what you have learned -- what you bring to that moment from your past what you have learned and what you have done and what it is that that tells you about what the most -- what the strongest step forward you can make is.

I'm going to do that from my perspective as a geoscientist and as a -- as a person who's worked in improving higher ed.

Mostly for a number of reasons one is that I want to model that for you not because you don't know how to do that, but I want to encourage you to do that while you're here. Partly because I think if we all do that, and we share what we think about where we are. It's a mechanism for broadening our understanding of each other and of the enterprise as a whole and of developing not only personal wisdom but collective wisdom about where we should -- where we want to go forward and partly, I'm going to do it because the real role of the first keynote is to give you something to talk about at the cocktail hour or whatever they call it now, now the next thing, the food break, and so my measure of success isn't whether or not I'm profound. It's whether or not you actually have something to talk about after this.

So that's where we're going -- somewhere here there's a slide thing. This thing -- oh, press the big green button.

(Laugh.)

>> Not the red one. The red one goes back.

(Laugh.)

>> I may need that. You never know.

What have we learned during COVID, so these are -- these are not really things we've learned or even -- many of you will know these things -- I want to make sure I'm just completely respectful of all the expertise in this room, but there are things at least for me have become -- my appreciation has been -- they've come to the fore of my thinking and my appreciation has been deepened.

One, inequities in higher ed are big, deep, and old. I don't think we -- I don't think things we can argue about, but I think -- I think at least I personally have a more profound and deeper understanding -- a more heartfelt -- deep in my heart sense of this problem.

Online communication and teaching have some valuable affordances. I think that this is something we've learned the hard way, and we have learned a lot, and it has come at a tremendous cost and a collective cost. This is one not to be -- these are not learning -- actually all of these are not learnings to be wasted.

Okay, students need a wide variety of different kinds of support. I mean, one of the most amazing things to me in the last couple years was watching not just the faculty rise to the occasion, but the institutions as a whole really learn where -- what all the strengths and assets were which, of course, people knew, but I don't think all of us understood as well -- I don't think we all understood that as collectively about all of the different parts of the system as we do now.

Communities and all aspects of communities are essential. That's how we are -- we have gotten through to where we are. And we in our systems and structures can change more and more rapidly than we thought, but at a tremendous cost, so I think one of the things about this moment is to think about -- not only what have we learned and how does it prepare us for the future but how can we capitalize on that moment -- on that momentum in ways that are not as -- that don't have as high of a cost 'cause I don't want to underplay the cost of the last 2 years in any sense.

Okay. So let's think a little bit about what we've accomplished not just what you've learned but what you've been doing.

Again, we have been doing a lot you in this room have been doing a lot. I don't want to attempt all the amazing things you have done as a group. It's got to be the IUSE PI group in those 10 years have been asked to pivot the most times in the shortest period of time which, of course, is in itself a learning experience and has made that -- made what we know -- is not to be wasted.

I'm going to do these in order as they're printed. The first is the major bullets teaching methods and technology as well as institutional structures and support structures, so you more than -- as much as anybody in the world have been at the center of that work, and we have -- these are areas that give us momentum. These are places where I think we have momentum. We want to -- want to use effectively to carry forward.

So kudos to you for all that you've done in this area. Minute

vigor of diversity inclusion including access in higher ed. This was not a new topic. The National Science Foundation has been focused on increasing diversity for my entire professional life, but I think the movement we've seen on this -- I was trying to remember my basic physics and remember the relationship between velocity and acceleration, and we have been accelerating, so we've got to keep that up so our velocity keeps going I believe is a square.

Lots of progress in that area and the third thing I just put on the list, which is the first bullet there's been a lot of work on envisioning of undergraduate STEM education. Work that was funded before the pandemic but took place during the pandemic, which, I think, has really been exciting because of the way that transformative experience of the pandemic as well as all the social challenges we've been facing as a country has really situated our thinking about that.

Okay. So with this to build on, what do we want our future to look like? So I'm going to -- do you remember with all due respect and all your takes, which are going to be different because you're looking at different perspectives --

(Inaudible.)

>> This will give us a place to start talking, so my take is informed by my peculiar vantage point which first is that I'm a geoscientist. The only difference between me, and those old guys in the room I'm not a guy.

(Laugh.)

>> Well, maybe it's probably an understatement.

The second is I was deeply involved in some activities of the National Academies of Science Engineering and Medicine, and we -- that we're imaging the faculty of undergraduate STEM education, and I'm going to use a lot of things that I learned from them, so I just want to give a shout-out to those people, and I'm going to use some of their words so.

And then the third thing that's been, I think, really influential that I would recommend to all of you if you haven't seen it is the National Science Foundation STEM Education for the Future Vision report which my involvement in there is that I read it in the last week.

(Laugh.)

>> So I'm not -- I'm just going to -- but I think it's really important and interesting.

For my perspective then, what's the goal of undergraduate STEM education? So I think coming out of COVID -- this was not my articulation of this going into -- or even until about 3 weeks ago, but I think the purpose of undergraduate STEM education is to enable a thriving, sustainable and just society, and I actually think -- awww, thank you, Noah.

(Laugh.)

>> I actually think that's the goal of education, not just of STEM education. I actually think that's the goal of all education at all levels, formal and informal is really in service to this really big

thing, and I think -- I'm really excited about this sort of statement of the purpose of undergraduate education and STEM education because I think it's an exciting framing for science -- STEM education because it puts us in a position to collaborate -- this is not something we can do by ourselves; right? It unites us with the rest of the educational enterprise in moving toward a really noble and important and clearly needed goal at the -- at the moment.

So that's how I would articulate this.

And in the past, I would have said, in fact -- I helped lead a session in the National Academies work, and this is how I would have articulated it. We have three goals: Workforce preparation --

(Inaudible.)

(Garbled.)

>> What I really like about this bigger framing are a couple things. One is that it unites the individual which in my list on the right about helping individuals flourish and about workforce preparation with the collective part, which is about civic participation and also about workforce preparation.

And we often think of those things in juxtaposition like we have to balance -- I'm going to play on a lot of the points you've made.

We often think about it as having something to balance the individual -- the goals of the individual against the societal goals and the civic goals or the workforce goals, and I think this is -- I think we have to stop thinking about those in opposition.

(Garbled.)

>> Come in alignment, right, so that's why --

(Inaudible.)

>> The second thing I really like about it -- I have to remember what I really like about it. The second thing is that STEM education is not separated from just society; right? That again, we bring those two things into alignment, and I think that -- I want to make sure that people just think I've gone off the societal deep end because oftentimes we think about basic research, research as going in the service side.

(Garbled.)

>> It goes -- making the world a better place. I don't think that happens science without thought in education really makes the world a better place so bring framing the goal this way we align those things, and we think about what is the role of even the most basic research, how does it play into creating the sustainable just society --

(Pause.)

>> At the personal and collective level, and this puts the emphasize on that action, so I want to give -- so the other thing I've learned about -- over the last 2 years is that giving talks to people who are not in the room is incredibly difficult, and I want to at this moment give a shout-out to the people who are nodding.

(Laugh.)

>> So thank you.

Okay, so that's where I think we're going if that's where we're going how would STEM education be different than it has been in the past? And this is an easy audience to talk about this because you're all doing this work, so the first thing we would center STEM in society. We would be teaching STEM through problems in their sociopolitical context, and we would be -- we would be connecting science to society and in particular to a just society, so we'd be thinking about how our work relates to that and looking at our work through examples and their sociopolitical context.

I was trying to think about whether this works for physics as well as it does for geoscience, I don't want to put out a challenge that is not -- that is all about my discipline, but I think it does, and I think it works if you start to think about this not -- so in some cases you can teach everything through problems and their sociopolitical context but in other cases you're going to have to think about the relationship between -- the -- at the program scale like where does -- where and how often and how do students get to make this connection again how do they -- how do you fill in the underpinnings that are a little bit more distant from that in ways that work for the discipline?

All right. Now I'm in trouble for time.

So the second thing is what I call a big view of viewing STEM. I think we have plowed a lot of ground and understand well authentic experiences where students are really doing science; right? And that's why we know that undergraduate research experiences and courses

are profound. That's why we know that internships are profound because those are opportunities for students to take their learning and use it in the real world and actually do the thing they're -- use their knowledge in a real way.

And for those -- you know, there's all sorts of really important reasons it's important it's true for motivating engagement and broadening participation stance. It's true -- the motivational and continued learning stance where having your work used provides a feedback mechanism. It's important for building skills, 21st century skills point of view, and it's important from an interdiscipline learning point of view and from a practicing point of view, but I think what would be different about my vision than what has been true in the past. And, again, you guys are doing this work the view of STEM being bigger, so it's not just doing research; it's not just working in the workforce in a STEM job it gets as broad as taking your science to, would and very widely from society, and I used some pictures that I dug up for a different picture, and you can see things working with Girl Scouts to working on data, to working on the Hill and working in engineering and in resilient communities so just thinking as broadly as we can about how we support people in using their STEM and throughout our society.

Okay. Third piece, full attention to ethics and justice, and we one of the reasons why I like this framing is that it puts ethics and justice at the middle, not on the periphery of learning STEM.

So in the National Science Foundation report they talked

briefly about -- it is critical to develop STEM learners ability and willingness to acknowledge, and we resolve the ethics in their work, and I think we have a thousand differences that's true and the one thing we have to do is to move quickly to understanding how to develop strong senses -- a strong sense of ethics and ability to act ethically recognize ethical situations in our -- in our work and in our students' work.

I want to just make connection between developing humility, empathy and respect and ethics in justice because developing humility, empathy and respect is important they're important for making inclusive classrooms; right? They're important for building our capacity to make a just society, and I would argue they're equally important for developing the ability of people to work on interdisciplinary teams; right?

If you can't -- in fact, I know this because there's research on it. If you cannot respect the approaches and expertise of the other people on your team, you can't collaborate effectively with that team, so that needs to extend not just to, you know, like from geoscientists to computer scientists but also to, like, engineers but also to, like, social scientists and humanities people and people who work in the world and people who have lived experience and getting that breadth of respect, and empathy and to promoting a just society but also to our ability to really work together in ways that are going to justly and effectively address the world's problems.

All right. I have 10 minutes. What could to make this vision

possible? Good thing I only have 10 minutes 'cause this is a big vision; right? And all of you know that the work that we're doing to improve higher education by making it more student-centered centered and making it more real world-centered and making it more exploratory makes it harder not easier or more time-consuming not easier; right?

So how -- what could we possibly do? So here I'm going to rest on the work on both the NFS and the National Academies and throw out some of their ideas.

So the -- this first one putting students at the center is not about making it easier or making it possible for us to achieve it. It's about a guardrail. If we don't put students at the center, we will not get to an education that is of the type that we all envision or whatever our words are for thriving, just or sustainable or equitable or good for everybody we have to do this and that means we have to put the students at the center thinking of what we teach and what their goals are rather than what our discipline says is important. It means we have to recognize what they can bring to the table, all of them, all of them individually, this is hard. You guys know how to do it better than I do, and it means that we have to think about the importance of instructional design mentoring support, all the things that support people -- students as whole people; right?

And I would add we need to think about that for faculty too. That's one of the big lessons from the pandemic how we are all -- before we are educators or scientists or anything else, we

are people, and we have to remember that that is -- you know, that's more important that we are people.

(Laugh.)

>> And we want have to help each other to thrive so -- okay.

Second thing. And, again, this is really building from the National Academies at NFS reports, and I commend those reports if you want think more.

The role of technology is really being -- is really central in people's thinking right now because of a couple of things of the importance -- this whole vision for an equitable -- or for a just, sustainable thriving society requires that there be good -- that you can't have a thriving, justice society -- you can't have a thriving society if everybody is not thriving. You can't have everybody thriving if segments of the population are excluded from the powerful education that STEM education provides, so we have to figure out how to have broad, equitable, accessible inclusive STEM for more people than are getting it now.

So, you know, figuring out how to, again, aligning technology, so that it's not access and affordability is pitted against quality. We have to figure out how actions, affordable and quality go together; right? So for everybody. A measure of success will be when everybody feels like they can send their kid everywhere to school no matter how much resources they have, right, when we stop thinking about different forms of education as being less expensive but more less good or something, like, that.

That's one big piece of technology. There's huge hope that it will make it easier to do this good kind of instruction. It's clear that it makes it -- that we can use it for access. We have other people on the panel who can speak to this better than I can. It helps us be better by providing knowledge of the system, and it's changing so fast, and so central to our society that we need to really be focused on how we integrate it into teaching, so the most inspiring thing out all these reports on technology is this notion that technology opens up new avenues for students to me -- new opportunities for students to use their knowledge in the world beyond the boundaries of their campus so lots of hope, opportunity and help in the role of opportunity when realizing this vision.

And then lastly, I want to talk about working in communities, so as Travis said, this has sort of been where my work has sort of been for the last 20 years. Not on the campus, though. I really think working in communities is where we're going to get the leverage to be able to get -- do more with less, more better education with less -- with less tuition.

(Laugh.)

>> Working together and being good at distributing the lift and the load in ways that the people who are best able to carry different parts are carrying those parts. That's the kind of an efficiency question, I guess, and it has tremendous power, and I think we started seeing that power in the pandemic.

And I think Tonya is in a much better position than I am on that

and -- I mean, going to stop on that one --

(Laugh.)

>> Before I put her in the position her telling me I'm all wet. I'm just going to let her talk.

(Laugh.)

>> The second thing that we have big power is thinking about education in -- it's not in its societal context but as part of society; right? So right now NFS is all about sustainable ecosystems and how about learning in undergraduate institutions plays together with K-12 education and graduate school and out of school activities and informal in order to make a really rich ecosystem of learning, but I think we can think even bigger than that and think about how those things fit into the communities in which they're happening and how they fit into the workforce, and if we think about that all together and think of it in lots of different ways, like where are the overlapping interests and where are the efficiencies but also how do students -- and people make their ways through those pathways and, you know -- I think there's a lot of power in there both for improving our capacity as educators but also in -- for capacity in education but also finding ways to distribute the load and the lift, so that it can be done more efficiently and effectively.

And then lastly I'm going to sum up by saying -- by just thinking about across institutions, so this is not a point I need to make to you 'cause you're all here, but my work has really been about how we bring together people from across institutions, so they can learn

from each other and share resources in order to both be better positioned -- if you understand what the people who are interested in the same things you are and adjacent things you're doing you're in a much better position to innovative in your own local context where local means the thing you're doing not necessarily the placed you're doing it necessarily, but, you know, that's really powerful form of -- that sharing of knowledge makes everybody's work better that's a lot about what this meeting is all about.

It also -- we have a lot of experience now with working together to develop resources so working in -- across institutions, not everything as you all know -- not everything we need to do needs to be done over and over and over again, so we can lighten the load there.

And I think the third thing, which, I think, some of the best examples are from the National Academies' roundtable and maybe from AAU work across institutions is using collective action in a group like this or in a community that's focused on something else -- you have the capacity for collective action that you can use to change the structures in your own institution or beyond your institution and that I think we haven't exploited as powerfully as we could yet, and I think that's a lot of promise of this meeting is to start thinking about things like that.

So I just want to return and end on the note on the importance of you guys, the IUUSE PIs and your community.

My paraphrase about IUUSE -- what IUUSE is a little different than the -- she's right I'm sure, but I would say that what you guys are

doing -- you're integrating implementation and research purpose of supporting widespread use in education. The thing that's marvelous about IUSE is that the theory of change is that you guys to use your work to inform other kinds of work and developing sets of tested model programs that can be used as a starting point for adaptation by others, and that's the theory that's in my mind IUSE is implementing in order to go from this group of -- what did she say 900 -- or no 2,000 projects to widespread transforming of higher education across the country or around the globe however big you want to think.

I ran a project that had a similar kind of logic model and the challenge is in between your work and everything's better, there's a little gap where a miracle happens.

(Laugh.)

>> And I want to encourage you while you're here to really think about that. That's the broader impact of your work. How does your work go into use and scale, and I think the answer guess are going to be different for each of you, but the answers -- many of the answers probably lie in this room and your interactions with each other?

I'm going to stop there. I hope I've at least been provocative for you to talk about at dinner or at least I've been entertaining or slightly funny so thank you.

(Applause.)

>> Okay. So now the plan is that first Tonya and then Abdimalik are going to respond for about 5 minutes, and our conversation is going to be informed by what we're going to talk about, and you use the

app to let us know what you're talking about. Short of you get to talk with us, but it's the best we can do at the moment. We'll all be at the poster session, and then you can all talk with us.

Tonya?

>> My comments will be relative to my position with what I've been doing since I joined Penn State since 2013 and what I've been doing on equity and inclusion. NFS was coming to an end during the pandemic toward the end of -- so we had this summer bridge for students trying to acclimate them to the College of engineering and that had been there for, you know, many years where students come for six weeks at the flagship campuses but then what we were looking at is how do we implement this at other campuses and Penn State has an interesting structure where they start where they have to transition to university park, and that's the project we were working on, and then COVID hit, and then we're at this juncture where we're thinking how does the pandemic affect our work? And for me I would say thinking about education and equity is one of the things we've been thinking about sort of post-COVID-19 and really reflecting on what was the point?

What are the lessons we were supposed to learn from this? What is the universe trying to teach us in terms of the things that were happening in 2020? And with the idea they can make meaning or sense what has occurred, how do we leverage those lessons and Cathy's talked about some of that; right?

You know, this pandemic was bound with racial equity issues

in terms of the impact of the virus and the wanting of the sociopolitical environment, and educational disruption, right, that inflexion point.

Also equalizing in some ways. Everybody needed to determine the level of risk that they could accept. Everyone had some new way of doing things or different way of doing things that they had to adapt to or to navigate, and so in that way there was a commonality, no matter what campus you were at, no matter what your background was, there were some things that you had to deal with.

And I think this was interesting, too, because it was answering equalizer -- an equalizer between students and faculty, right this wasn't something that was just happening to the students, it was happening to the instructors who were in the classroom. There were folks who were older and more vulnerable to the virus than the student population, and they're thinking about what's the risk of going to work? There were folks who were overwhelmed with caregiving illness and childcare. There were things that were emotionally impacted, right, by the heaviness of all of the stuff that was going on in society.

And then on our campus everybody had to deal with restrictions, masking, congregating in person, testing, the potential for quarantining and isolation loomed over everybody, so you have this cloud over what you're trying to do, and I think what we can come out of that reflecting on how did we make it all through it we're not all the way through, but we're a considerable way through and

what are we carrying with us into new ways of operating?

And if you think about this in terms of the bigger scale -- if we were to compare this this to something we were studying, right, it's really about resilience, right, what are the elements of resilience that characterize the students who maintained and recovered and distinguished them from students who were taken out by the disruption and what did we try to do to mitigate that and what are we still trying to do to try to get students engaged and entering into STEM and going to class even after the pandemic?

And what is this long tail of COVID, right, that's going to affect future faculty success and future student success?

And for me there were a few lessons and one -- you know, we've kind of talked -- or Cathy kind of reflected on this this idea of collaboration and collaboration across context, and I really like the comment about being good about sharing the lift and the load we had to share the list and the load with each other and not try to be the hero in everything and really think about new ways of doing things.

And so some of that for us were all these teams that popped up of people who were in different physical locations thinking about, okay, the technology issues and the scholarship issues and some of these students, you know, library access and the mental health -- all of these things that we're thinking about together, and that's that ecosystem within our campuses of how we're working together. How do we keep faculty teaching? How do we keep students learning? That

was the big thing. How do we keep everybody going and how do we leverage what's happening nationally? Leveraging IUSE and leveraging the IRAP and help people inform what we're doing; right? Those are the things that sort of highlighted as a community how do we keep -- how do we keep going in.

And I think part of that is trying to figure out what do you have to build on? Or what do you have to grasp if you're trying to climb up and how do you lift others as you're climbing out of something like that.

The other thing I thought was really important was the idea of creativity. We had to develop new ways to get things done, and there was a lot of exemplars of faculty to get all the students to engage. How did you get them to turn on their cameras what did you do and all the things we were thinking about in the classroom?

The other thing to think about if you don't have a spring break, if everybody is inside, what are you doing? How are you getting students engaged, and this is where I think that connection between folks, and we student affairs, in rec services, in counseling, in financial literacy, thinking about how do we develop activities and interventions, 1, to educate the faculty who are the frontline and the faculty were the frontline because that's the one thing students might do is come to class; right? How do you make sure the students who are going to class get the message about the wellness days? Let's everybody do yoga online let's do an escape room and do these activities and a lot of these creative activities kept popping up

and create the STEM.

The STEM creativity also helped us make meaning; right? How do we center on wellness and well-being and get a faculty member worry about so much about -- you're slamming the students to make sure nobody is cheating online, right, how do we handle that, and so I think that was an important issue?

And then I think the other thing, that is the third thing that's really important, is cultural agility, and we're talking about sort of this idea of centering STEM and society and our societal context is really about thinking about conflicts of allyship, antiracism, equity and pedagogy? How do we make empathy and make accommodations for the most vulnerable and marginalized members, and I think these dynamics of creativity, cultural agility, collaboration are the things that we have to figure out how to sustain if we're going to achieve some of these sort of broader goals of creating this thriving and sustainable and just society from our STEM folks?

(Applause.)

>> Good afternoon. Can you hear me? Yep, so I want to piggyback off both -- both phenomenal points, but the quote that you had earlier about the goal is enable a thriving and sustainable and just society we think of the inverse of that that there are disabling conditions for a nonthriving population within our communities that's not sustainable, and it's unjust, and so that means we have to be very, very intentional, and we deliberate in designing or in your terms reverse engineering something that's very proscriptive, and we saw

that in the pandemic. We saw that every time we get the money and the funds I was on a campus before I moved to the statewide level because we did some dynamic stuff at our campus that opened the eyes of the government and the chanceries we saw just money and resources just being thrown, right, the more laptops, okay, but there's WiFi deserts; right?

Okay, you've given a tablet, but you don't have Adobe or Microsoft Word or anything to upload these documents in. We're rationing off, you know, one laptop per family that's driving this; right? Particularly how we didn't have enough toilet paper by the way. We want to figure out the connection between COVID and toilet paper.

(Laugh.)

>> That's one of the projects I want to figure out, but we were having these discussions. We'd have for example a rollout of a project, but it wasn't intentionally thought out. But when we about inequities, we have to be very -- how do you embed not sprinkle on DEI approaches to the work.

For example, we had some of the institutions had parking lots that they set up and said, okay, this is a WiFi hot spot, pull up with their vehicle. You can safely study here or do your homework here.

But then there's police patrols, and now you have the anxiety and the trauma of my registration expired, I haven't had access to DMV I'm waiting for my tags, will I get towed, and it's the role of

our campus police department to ticket and 2000 or is it more important for our communities to be comfortable. As we roll out these projects do we have these students at the center.

We saw that in Salinas, California, the famous image I shared about the two young Mexican girls sitting outside of a Taco Bell, Silicon Valley doing their healthcare, where's the childcare, where's the access to the WiFi? One of the things that's very, very important how they have the enabling conditions where people not just survive but thrive, and the recognition going through and still grappling for we're asking for basic elements, I can't breathe, certain lives matter. People should be thriving on our campuses, thriving in our institutions. So how then do we design something for that, so that's one of the things I want, to push us through with the basic rudimentary levels of changing.

The second thing when we talk about justice, we have, unfortunately, went away from things that are very, very important and paramount to student success and even just be collegial, that's love, empathy, caring. We're talking about mental health -- a huge discussion about mental health with the foundational pieces to well-being -- are you loved, are you validated? Are you cared for? Do you feel worthy, a sense of belonging? At our campuses? And I think that's some of the things that as we got disconnected we felt reconnected digitally and how to humanize our digital space, so I remember a lot of our faculty initially -- we actually had a spring break, but it was just a -- really learn how to use technology.

(Laugh.)

>> And then we had another next week, but we got together, okay, hey, I know you're teaching philosophy, I know you're doing counseling, I know you're doing student services and financial aid, I have a student here that doesn't get his ad code -- so we start to collaborate, and we had online symposiums and a development week and extreme collegiality and collaborative work, and we get to see what our colleagues doing. We have faculty members on TikTok using Instagram live to answer questions, IG live sessions, and we have some who come across the border, how do we have engage with them? We need to figure out how to humanize the digital space.

Another aspect that when we look at designing, we have to be very, very -- at least in California, we're trying to look at equity as the most progressive as we can.

Now, there's always a new term, right, one of the things I love about social scientists in the digital world is new words, there's always new terms.

(Laugh.)

>> But how then could you be truly inclusive? Is, and it's a thing where you're part of the process and the inception of it. It can't be something you add on in ancillary services, and so as we continuously move in this post-COVID era, which I definitely am with Katherine. It's editors for her to stay but hybrid or blended learning.

How many of you by raising your hands have had your children

or students have to be transition because of an outbreak in your school, so that agility, that adaptability is crucial. It's critical. How do we maintain the momentum to have the opportunity for us to pivot if need be and come back but not completely need these services?

And lastly, I want to say this there's both sides of the coin on this. There's research students felt less microaggressed and when they turned the camera on they were exposing the socioeconomic conditions of their home, their poverty, there's 6, 7, 8 people quarantining together so there has to be the sensitivity that's important how do we maintain the level of inclusivity and understand we have to design with all this in mind.

Which then goes back to my fundamental point humanizing the digital space and understand we teach humans. I can't teach them someone that's hungry or scared and traumatized, and we're constantly causing trauma --

(Laugh.)

>> How do we center our students with all these perspectives? And so those are things that come to my mind as I unpack some of your opening statements, Cathy.

(Applause.)

>> Thank you. Go ahead.

>> I just want to remind you all if you're looking for a place to submit audience questions within the Whova app there's a spot for Q & A. Thank you to the many of you who already sent those to us

we'll continue take them and provide them for our session or Twitter.

>> They're both logging on to send each other questions.

(Laugh.)

>> I'm making sure to check the score.

(Laugh.)

>> I get to start the questions, and I think we all talked about moving that into the future, and I have to say there were some wonderful moments at the beginning even when it was so hard. There were some wonderful moments where we took the time or we had the time or we -- we recognized so much that we had to -- you know, we were depending on each other so much, so that we could make time to give back to our community, and so I already can feel a slide away from that, I think.

Do you guys have thoughts on, you know -- sharing creativity and agility, you know, creating the -- making the -- humanizing the digital space, being -- central inequity and design and appreciating that there are basic needs that are going to stand in the way. It was so in our face about basic needs standing in the way of learning.

How do we -- you know, how do we keep that momentum going? How do we capitalize on those, you know, how do we carry that into the future? I think the comment about the holistic kind of education and not -- and as STEM faculty realizing that we're a part of that. It's not something that somebody asked us. It's something that we do as well. To think about how to point students to where the fuel tanks are, what -- you know, where the financial literacy center is. You don't have to provide it all but being able to say: Here are

all of the things you need, you know -- one of the things we developed for the students is what we called the high pivot plan.

(Laugh.)

>> It was documented. Here's the names of all of the people you need to know. Do you have a good place to study when you leave? Are you -- you know, here's some access to where the fuel tanks are -- food banks are and think of that in the holistic way, and we there's the online learning center and the tutors -- because oftentimes we just focus on what to do for my class, what's to do in our major, what's to do from the context of your studies but not thinking about having a place, you know -- the library being closed was a big deal for some students because that's where they were -- having to stay-at-home not out of the closet, and I don't have a safe place to be at home let alone just study and thinking of those things and helping people find resources.

I would like us to take with us the idea of the whole student and not forget that these resources are there.

>> Well, and take forward the learning that we did about where the resources are.

>> Yeah, yeah.

>> And what the whole campus community looks like.

>> And that's incorporating your syllabi or having -- or syllabi -- it's on equitizing the syllabus sometimes folks use it as a mandate, rubric-based here's plagiarizing, here's -- well, what about the school bus resources? Where's your local food bank, the

counselor for a local mental health -- and looking at the next level on the images you had on wrap-around services having advocates from instructional faculty to noninstructional faculty.

Look, there's a need for more mental health counselors because that impacts my students' success: Why don't have enough services to support these recreational services; right? Helping to align recreation around campuses that's central of the student and that takes you out of that very isolated model with your grant or program or class becoming a larger picture to be institutional changes, and we would be institutional changed and what I mean institutionalized?

(Laugh.)

>> And so that's very, very important, and I think -- I think I can get more than one clap for that, I hope.

(Laugh.)

>> So how then can we leverage -- that's how institutional change becomes.

>> Uh-huh.

>> More of, you know, plausible.

>> I've got like the agility creativity -- that, you know -- the -- the resilience, that to me is -- I mean, part of the reason we could be -- well, we were agile and creative because we had to be, but we also had, you know -- we're in a moment of unusual circumstances, so you could think about -- we were in a time when all of our time management strategists were on their -- so creativity and agility in some sense comes from having the time to be creative

and agile and how do we keep that going or what do you think about that?

>> I think one is leveraging sort of the creativity within the community, within the collective. There were folks who figured some things out or did some really innovative things. One of the things -- the whole pandemic, right, there were people who never tried to use online tools or remote learning, and they had to jump in, right, you know, within a week we were like okay -- everybody is going remote Monday; right? And so all of these people who never dipped their toe and worked with an instructional designer had to do that, but there were people who had already flipped their classrooms that were the leaders. And, first of all, it elevated people who actually had invested in educational innovation in a way that had not been elevated before so how did we maintain a structure that values people who are the educational innovatives in that space so to me there's a cultural aspect to this, and one of the provost had for the teaming evaluations rather than student ratings of student reflections compare it to the pandemic and let's report on what we did, so there's an idea -- here's how I invested in teaching and in some ways I think that helps us in the educational space especially in STEM when there's such a high value on the research and the funding and maybe those folks who are really focusing on instruction don't get that kind of praise or that kind of elevation, hopefully we'll be able to I don't think you harvest that -- you know, harvest that.

>> And I think humility is an essential part of that. I come to you all with a learner's humility, which is a foundational aspect in allowing agreeable degrees for those type of conditions to flourish. For me to ask for help. The -- letting go of my ego to say, okay, my students -- they're all so vulnerable. They're all so scared, right, so we come down to a level of engagement, which is such a humanizing thing for me that, wow, there's -- we're all -- we're all -- nobody knows what's going on at one point.

(Laugh.)

>> So the whole world didn't know what was going on so -- and then there was a level of interdependence so me masking is the point of you masking. You catching the virus and my health doesn't matter in a bubble, and I need you to get taken care of and that level of interdependence of us quarantining or being vaccinated or us wearing masks, and there's a level of interdependence which can lead to a level of collaboration asking for resources, you know, ask and advocate, and I think that allows us to think of analyze pieces I may not be thinking of because -- and so breaking down those isolations having holistic support and breaking down those barriers is essential, and I think that's what we need to continuously do as we move forward in this pandemic.

>> Uh-huh.

>> Thanks. I hope this works.

(Laugh.)

>> I want to go back sort of the topic of

equity -- centering -- centering ethics and justice and humility and empathy in the science curriculum, and I have questions from people about: How -- if that's where we think we're going and or if we think that's important, how do we bring along the rest of the campus?

How do we -- how do we make arguments for any of the things that we've been talking about in ways that El violate them -- that bring along those who are not, you know, onboard already. I think you guys are really in a position to think about that from the equity indication and maybe we can expand to thinking about the ethics and justice.

>> You know, my messaging is that the work really gets harder in the disciplines. Often, the people that I'm convening in are the community, willing interested in equity or whatever, and then what can we do but then it's how do we have these conversations within our departments maybe somebody is on the fence maybe they're on the other side of the fence, and we've simply seen an example of antiscience has affected our public health. It's affected the affected the spread of the virus, and one of the things -- I think Neal DeGrasse Tyson has been really good -- is to try to get to every person. How did we get out of the ivory tower and have conversations with which who are citizens about science and really talk about how important science is to the community in a way where we're helping people understand the value of evidence, the value of data, the importance of statistics, those types of things because those conversations about how do we deal with not the faculty, not the

students, but the staff that, would at the university who are "anti" everything that we're talking about? We have to get rid of that hubris that we bring and talk to people that are around us about why we love what we do and why we think it matters to make our society healthy, and I think -- and that's a fundamental thing for our students in understanding that they are going to be in a position to community with a broad variety of people.

>> And I think leveraging data is our way of doing that.

>> Uh-huh.

>> Common and not so common as we found out. Even more now, but I think I definitely agree with you Tonya, that we need to simplify things. As academics we sometimes love creating words. We put together too much hyperconcepts to what occurs. I remember one time I had a student explain, and he said I've been microaggressed by a professor, and then, you know, figuring out a way -- okay, what's a microaggression? What's the racist comment that you made? Oh, just say that then. Well, we have to simplify and understand what is the terminology and the practical things and how we can implement is the things at the data level.

The other thing that is more important is moving forward we have to fill out ways to be advocates for each other for each other, and I think if we have this grabs a barrel that affects the works that we do as an institution the resourced some and -- it creates this dynamic and how it's important, and I think it's important for us to equitize all of that and have something that centers us. Our

students are a center but more importantly if justice is our goal, something that we can work towards we have that we were able to in the state of California turn over the EEO regulation. We changed the law and changed regulations to create diversity because every single student, classified, VPs of instruction, VPs, CEOs and college students, police officers and their unions, everyone got around and approved comprehensive DEI reforms because we had justice as our goal, and we leveraged of the racial reckoning, and sometimes we have to have a bigger goal and trust on that.

You'll hopefully -- and then lastly, we have to talk to each other. I think, you know -- you know, we sometimes live in our bubbles, and we cut people off and some people do deserve that.

(Laugh.)

>> I think if you don't talk to them -- I was in a coalition and be willing and move people from one edge to move them to the next.

>> So I would add one -- one other --

>> When I look is not taking students as full partners. If we're centering students, we would have to think how we would like to be treated when we're being part of a community. We don't want to be done too. We want to be done with; right? So how do we bring the students really into the center of the -- of the educational process and of not only that but of making the process -- the process of making change and of making education better and -- I mean, there's so many ways to do that the first of, which is just to have their voices where we can hear them.

>> Uh-huh.

>> But I think students are an amazing vector; right? So it's a lot easier for students to convince anybody, another faculty member, a community member, a politician, anybody about something than it is for me to convince them.

>> And even where they're at is important. We do have levels the antiracism from the fear zone, you know, in the growth zone people in the learning zone so if I'm able to do a professional development workshop, and I always do this poll where are you? And I have statements I don't believe racism exists or I deny it's a problem or I don't like to talk about this it makes me uncomfortable or I love to talk about things that make me uncomfortable, and I can sit with my discussion and maybe people can grow from the learning zone.

From the learning zone, who can you pull from the growth zone? From the growth zone, who can you pull from the fear zone? What are your fears or apprehensions? Well, I have those similar fears I thought it was an attack on me it was looking at things systemically is in the institution and have to personalize it and how do we grow in these continuums and grow from it. It comes from dialog and grace and empathy and love, and these weird emotions that we're going to talk about education more.

>> So it's interesting for me because, you know, the pandemic created an opportunity for some intergenerational application, and I had a first year college student, and a high school student someone who is a young professional well, people of color except for my husband

who's white, and so we're having this conversation about all of the things that are going on, and I think, 1, is there are some things that are generational in terms of how much change people want to see and why don't we do it now, and I want to show up as my full self, and I don't want to have to adapt to this full environment and all-that, and that's the one thing and for us justice is important or we won't have students. They will go to something else.

We are creating people who are disaffected with STEM because of the cultures that we set up within our STEM programs, and it's important for Americans to go in to STEM. We have to create an environment that attracts them and not enables not disables where there is love and there is support, and they can be their full selves, and I think that's the -- is having a student part of the conversation what is the agreement of how groups should work? Can we have not microaggressions and the professor is saying I'm not equipped to deal with that.

(Laugh.)

>> So that -- having those conversations -- well, tell me what that looks like. What are you talking about not a way toward getting them to prove their trauma but what can I do to help you feel more comfortable so groups won't be just random they'll have a structure and there'll be expectation that everybody gets an opportunity to lead, right, and those types of things to create more justice within the STEM lab, within the STEM classroom?

>> Nicely said. That was a good model of how professional

development can come from students as well as from other faculty and other and other sources, so you guys answered questions about justice, but you did how we get people with justice, but you did a great job of articulating using data aligning to bigger goal and having effective communications with all of the stakeholders or community members or however you want to connecting to the day-to-day, advocating for each other, using students, meeting people where they are and talking to each other and sharing information, so we had a number of questions that were really about how do we make change happen, and I thought that was a nice sort of articulation of those.

The only one I would add is -- which really comes from the last panel I helped moderate if we're going to get change to happen, we have to align we have to align at the top with what's happening at the bottom, so we get the whole system moving, and that has to be done by a combination of really -- by getting having a vision that people can buy in as you articulated how you get people to buy into the justice system

But having enough empathy of the part system -- that's a complicated concept in a sense and that people know a lot a great deal. I'm going to shift the conversation now in a sort of -- one of these inflections pointless 'cause we have -- how much do we have.
>> About 10 minutes.

>> 10 minutes, so -- one of the things I thought was interesting in the framing that I put up and enthusiasm for many people it would

really be hard to see the science in that; right? Where's the science in I would say creating a STEM and justice community in a sustainable community, but it's not just for science but where is the science education and how does the science education -- how does we think of science education come together with that bigger goal of justice? And I'm not thinking just about -- I mean, you guys have spoken very eloquently about the importance of creating inclusive teaching environments and all of that but when we think about how we're trying to -- how we're trying to teach science, and we how we're trying to move to real world experiences, how do we bring together this interest in, you know, educating physicists, engineers, geoscientists and preparing them to, would in the worldwide and to bring their science -- or engaging them and bring their science into the world in ways that don't dilute or compromise the education? Do you have thoughts on that?

>> So there are a lot of thoughts that I have on that -- on that topic, and I think one is, you know, in engineering, I think there's a strong bent towards the applied. Who are we designing for? What problems are we choosing to attack or try to solve? What is the barrier to the adaptation of this technology from a scientific standpoint; right? And one of the things we have to realize is that there are things we could solve; right? But the social political things are the barriers, and we don't have a handle on it. We don't have a business in the world. We can't get people to make science-based choices we haven't thought about their humanity and could would on

the social science that combines with that hard science; right? In order to -- in order to do things, so there's a value in that and, first of all, realizing our science may be limited by our biases. We may be actually not doing our best work because we haven't addressed our own internal biases that frame how we answer a question or try to say that we're objective? No, you're not objective.

And if you're aware of that lack of objectivity you can do better controls. You have -- you come up with better data, and so, yeah. >> I start off by having over 120 ventures that we use on a daily basis specifically around black brown people with gifted -- (Inaudible.)

>> To the streetlights to the walkers and the tissue holders, the color television and literal all the mask, the gas mask to blood banks -- I go over all the different contributions of black and brown people to science. And inventions, and then I ask them how many of you knew about this and how many of you in your presentations or classroom spend many 2 minutes, 3 minutes highlight one invention? And the overall response is I did not know that, and I said well, if you look at the data going back of where are specifically black and brown males comes into STEM, and they don't see themselves they see people with invention that is look like them when you look at the social-emotional aspects of learning, it's huge aspects of learning. If I can't see myself if I'm invalidated there's an erasure of my contributions to this work and all I'm limited to is some pyramids thousands of years' ago my peoples contributions to

science but not the car I'm driving, not the mask I'm wearing, right, and I feel a certain way and how do we validate them. I think we can continue the rigor, but we have to have the adequate pedagogy and curriculum to support and validate that student and say this was created by someone that looks like you, and then they can see the Lonnie Johnsons of the world what my contributions contribute to think that went to Jupiter, oh, my God I didn't realize that and created the super soaker, and it's important we continuously and continuously educate in a humble way about our contributions of those who are bias on the margins of science. I think that's important so validation is important.

I think, you know, having folks' representation is ideal, and we know that because the validation talks about how paramount in a student's success it's paramount, and I think that's one way we can start.

>> So I want to stay on this theme of how we connect science to society in our society, so there's a question about, you know, the practicalities of that, you know, what -- how do we handle it when the goals of the when the things that students have that don't align with the education that we provide how do we align the mismatch between the focus of the class or a gap between the focus of the class and providing societal context? You want to try to go there?

>> Yeah, we're working on that. We don't have it figured out. We've done work -- Patreese Ingram, who's associate dean in the College of Ag, did work talking about bias in the USDA and funding

black farmers because some of it is -- we need to understand our history. We need to understand Henrietta lacks. We understand the Tuskegee experiment. We need to understand how ethics has been used -- and try -- the efforts to erase Native American heritage by academics, right, by culture and realize there's not -- there's not just -- there's not just a passive thing that science has done or has been used to do to affect society. And to think about how do we address that? How do we repair that? How do we develop ethical scientists and engineers that are making decisions that don't create things like the flint water crisis; right? We have to think about how our decisions are affecting society, and there's so many people in society that a vaccine could help them but would rather take a thing that's developed for animals.

What's the ethics? Who told them that that was okay; right? As we're thinking about this there's ethics there and if people don't think I have a responsibility to tell people about data, I have a responsibility to educate people and to reverse this sort of negative impact of what they think the science the entrepreneurial, you know -- I read some article with some fitness person with an unscrupulous biochemist, and I was, like, what? What are we talking about? -- how do we think it's important for us to have people to think about their role in leading, their role in leading ethically and their role in leading -- to provide more Americans to provide them more access to things that will most of

>> There's models out there like Henry Ford and -- when you go down

to Tuskegee University, and you see the log-ins there and thought museums that were created -- there's Jim Crow area -- there's of a scientists who said we need to get to the heart of the matter in creating this program; I don't care what you look at, and you have some brilliance that you can contribute to the science and the genius. I think that's part of the meritocracies that tries to go I think that's essential.

The other part is the professional development that we all be subject-matter experts of PhDs and masters degrees in your subjects but to take that knowledge and to articulate it in a fashion that's digestible that's understandable to a student. Teaching is an art form mentorship. It's an art form and allow yourself to have a metalogical that allows you to dance in that way, in an artistic fashion is important to get to that work, and you think how do I take this knowledge to my head and something I'm passionate about I spent 10 or 15 years and working in that, and I want to pour this into this person, and so part of that the professional development that we want to, hopefully, this new COVID, post-COVID era that I'm how do we do it in nonequated ideas I'm the PI I'm the lead researcher on this lead author on this; right? How I say goes rather than humble -- bringing folks in a more collaborative incorporating people's genius and ideas in contributions, and I'm going to say this like a broken record that's love exit and things I've said about the social sciences.

(Laugh.)

>> But that's going to get us to move the needle, and I don't think they're going to be too daunting ideas.

>> Yeah, yeah, and I think there's this sort of -- a lot of us scientists, engineers are first generation equity practitioners.

>> Hmmm.

>> We are not the smartest in the room or the most knowledgeable in a room about these topics, and we need to be engaged with social scientists to sort of help us better understand our history and educate ourselves, so that we do feel more effective at doing this.

>> And I would argue that women need to be the smartest. In my former campus there was the smartest professor the quicker -- he has the highest passing rate of calculus, trig, everything, and all of the professors what's your trick -- what's your trick. He's a DJ.

(Laugh.)

>> He throws on a math jam before finals week gets everyone to order a pizza and has a huge block party and get students jammed, and you have people who hate math, oh, my gosh, but they're up there until 1:00 AM in the morning having a party on campus because the DJ shadow is his name the math professor that works for NASA that hypes them up. That equity work to me is more profound than any equity community the DI officer --

(Laugh.)

>> Because he loves his work and he loves his students, and he engages them at a profound level.

>> We are now standing between these guys and food and posters.

(Laugh.)

>> I think the combination of love, equity, empathy, respect and humility, DJing and --

(Laugh.)

>> Now I lost the last thing you said I think that's a good spot to stop. I want to thank you so much, and I learned a great deal learning from your talk.

(Applause.)

>> I want to thank you, guys, for the questions that people submitted, and we for your encouragement through nods and attention during the things we miss when we're talking to blank screens and reiterate we're not going anywhere. We'll be at the -- at the next session too, so we hope -- I hope, and I think I speak to them that we'll have get a chance to talk to you more directly in the next session so Thank you all.

>> Okay, party people, I have a couple quick announcements so hold your applause for a second, and you can applause voraciously for this incredible people. I'm the last thing standing between you and a canape, perhaps a nice thing of meat on a stick, some really, really yummy foods. There will be other option as well not just those two things.

A couple quick housekeeping items. Just in case anybody is in need of a mask or if your mask breaks or anything like that I just want to let you know there are extra masks at the registration desk they'll be there the entire summit so please feel free to stop by

if you need any of those.

Tomorrow morning, we will have breakfast discussions so there will be in this room right where you are and there will be stands on various tables on topics that were generated by you all. Thank you so very much so scope out what discussion you might be interested in. There'll also be: Choose your own adventure tables where you can kind of impromptu create discussions or there may be like: I'm from California. I need coffee. Don't talk to me for 3 minutes, please, table, sorry, sorry for those of you from the West Coast where it might be so early in the morning.

And finally just in case any of you need recommendations for your free evening Tuesday evening, please feel free to ask myself, our AAAS staff will be around. Many of us live here in the district. I live about 2 miles from here, and you can chat us through Whova. You can -- if you're a Tweeter, you can Tweet me at Travis York I'm happy to give recommendations of all my favorite places in DC, and we're hoping we get a chance to meet and chat with you in the next party session, which is the poster reception so please, please, please come and join us. There may be some DJing I don't know. There may be some cats on a Roomba. None of those things are happening, but there will be great food and great science on posters so please so please join me for the poster reception, which is located just through those doors behind you.

(Applause.)

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