Bringing Science into the Classroom
AIAN Education Manager Webinar Series

Vanessa Maanao-French: My name is Vanessa Maanao-French, and I work here in Seattle at the National Center on Quality Teaching and Learning, and I lead the AIAN project that we have here. And it's my pleasure as always to be with you all. And to my right is the lovely Dawn.

Dawn Williams: Yes, hello, everyone. Those are my two little girls there, and they're 3 and 5 years old and very interested in science these days. So I'm going to take what I hear back home to them.

Vanessa: So let's get started. This is what I want to do today. I would like to provide a definition for the scientific method, because this is what we want teachers to be using in the classroom. Give some strategies for using the scientific method in the classroom. Connect all of this thinking that we're doing today around science to the Head Start Framework, very important. And then, finally, provide some suggestions to how to improve teacher skill in this area. So our calling card, we show this every time because it's so important. This is the effective practice framework house. And we're going to be focusing I think for the rest of the year on the foundation, so those engaging interactions and environments. And today specifically we'll be looking at instructional interactions with the scientific method, which I'm sure everybody's excited about.

Dawn: I am.

Vanessa: This is a hot topic. So let's start with a little activity. And what we would like for you to do, you'll see this little axis here, we want you to plot where you sit with science, your own comfort level with science, and then your own personal comfort level teaching science. I know you guys aren't teachers in the classroom necessarily, but it's important to make this personal today. How do you feel about science and teaching it to preschoolers? So Dawn's going to show you how to do that.

Dawn: All right, and this is a new activity we're going to try here on Adobe Connect. So you're going to see your screen change a little bit. So what's going to happen is that I am going to make you all presenters, and once you get into that area, you'll be able to click on a black rectangle that'll be on a gray bar above the slide, and you'll be able to select the star shape and then move your cursor over to the screen and click, and then your star will show up where you want it to be on the scatterplot. So I'm going to review those directions once again for you -- and once we get started. So right now I'm going to go ahead and switch your screen and make you all presenters, and then you will be able to do this activity. So just a moment, please.

Vanessa: And then you guys can take over and do the rest of the presentation. [Laughs]

Dawn: All right, and so once you're over there as a presenter, you should notice at the top of your screen is a... is an area where you can select the drawing tools. So hopefully you see that black rectangle where you can click. All right. Great. I see a star going up there already. So where you see the black

rectangle, you hover over that, and you should see a star show up. Fantastic, that's great. It looks like it's working to me. All right. Yeah, where are you at? Where is your comfort level?

Vanessa: You guys are good.

Dawn: Your own comfort level with science compared to your comfort level for teaching about science. We'll wait just about 30 more seconds so we can hear. All right. What do you think about that, Vanessa?

Vanessa: I'm impressed, because if I were -- let me do mine. [Laughs] So this is me. I want to put myself in there. Let's get my little star. My own comfort level with science is somewhere right around here, and my -- you know, I think this is great. I think it shows that there's a comfort level with science but also that there's some comfort in teaching preschool science, but there's some space in the middle to grow, and I always love that.

Dawn: Mm-hmm, mm-hmm.

Vanessa: Is that me, like glass half full? [Laugh]

Dawn: That makes perfect sense to me.

Vanessa: Okay. So I just want to do a quick check-in on sound. We did have one person let us know that they can't hear us. So if you cannot hear us, can you raise your hand for us so we can get a quick poll of if you -- does that make sense, raise your hand if you can't hear us? [Laughs] How can they know to raise their hand?

Dawn: You know what, you did it just right, because you already put it there in chat that they couldn't.

Vanessa: Okay

Dawn: So that was good work, and no one said anything. So fantastic.

Vanessa: All right, we're going to keep going.

Dawn: We are.

Vanessa: I'm excited to share the rest of this webinar. Okay. So that was that. You guys now know -- So now we know we can do those scatterplots again. I'm so excited. So we're going to show you a quick video about getting into the pool. You may have seen this last week, but it's a good reminder. [Video begins].

Dr. Daryl B. Greenfield: Many of teachers currently in the system, especially those working with young kids, have had a bad experience. They're frightened that children will ask them questions that they don't know the answer to. They also think that there is one and only one right answer, there's only one and

one way — correct way of doing something. And it turns out that's really not true. So, the difficult thing is to, in some sense, get them to stick their toe in the water, or to, at least, get into the pool and try it. Because — what they quickly learn and we've seen this with teachers that we've worked with in Miami-Dade County that are part of a science project that we have there -- is that science is a hands-on activity. And teachers, preschool teachers, are good at doing and designing hands-on activities. Children love hands-on activity.

And you can see when you start to do science that there is not one and only one way of doing something. And if you don't know the answer, that's part of what science is about. So instead of worrying about, oh, the child is going to ask me a question I don't know the answer to, you can say, "That's a great question. How can we use science to help us answer that question?" And there's a lot of resources that are available on the Internet or learning how to produce scientific evidence or good evidence to address questions. So part of the excitement for children, and this could be true of teachers as well, in doing science, is that it is a method for answering questions. You don't -- scientists typically don't know the answer to a question when they pose it. The goal is, here, you have a method and resources to help you answer that question. [Video ends]

Vanessa: I love that video because the key message is you don't know — have to know the answer, which I think is great news. Especially if you're working with 3-, 4-, and 5-year-olds, who will ask bizarre questions.

Dawn: Yeah.

Vanessa: And it's okay to say, you know, I don't know, let's figure that out together. And that's a message I would love for you to really reinforce with your teachers, is if they have that feeling of safety that it's okay to not know and that it's okay to explore with the kids and find the answer together, that really does open up the possibilities to what you can explore in science. It doesn't have to be something that's, you know, canned, the same thing we do every year: let's do sink and float, let's put some flowers in water with some food coloring in it. These are things that are always interesting, and kids love to do them, but science doesn't have to be boxed in like that. So, good news, you don't have to know the answer. Dive right in with the kids. Go with their bizarre questions. [Laugh] So here's our definition of the scientific method. The scientific method is a series of steps that help children understand their world. And when you think about it that way, it just seems like so much more fun.

Dawn: Mm-hmm.

Vanessa: The word "science" used to make me cringe in high school. "If I thought about it this way", it's just how I'm learning to understand the world, oh my goodness, change of perspective. So this is what teachers do when they help kids employ the scientific method. They help children ask questions. And they don't need a lot of prompting for that, but it's good to model and prompt questions from kids. They ask children to observe the world around them. And they give them tools to help them do it. They encourage children to predict during activities. Love that. Because their predictions are just as wild as their questions. They create opportunities for children to experiment, to test out what they predict. And then, finally, and this is a piece that we often miss when we're thinking about science, is that we give

children the space and time to discuss the results of their experiments. What did we learn and what did we want to know more about? So let's watch another video. And this is Dr. Megan Bang, who's here at the University of Washington. [Video begins]

Woman: Studies show that even 3- and 4-year-olds are ready for age-appropriate scientific activities and observation.

Dr. Megan Bang: In fact, increasingly, we know from research that kids can do far more extraordinary things than we typically give them credit for. And that started with kindergarten and pushed up. And a lot for me is the point is that I think it's true with 3-year-olds, 4-year-olds, 5-year-olds. So that pre-K age, I think there's far more going on there around complex observations and sense-making than we have typically thought about or incorporated into classrooms. [Video ends]

Vanessa: Video short and sweet, but her message here really is that our 3- and 4-year-olds are ready for science. And too often we're like, eh, it's too complex. But Dr. Banks' message really is they're ready now. And 3-year-olds, you know, by the time kids are 3, they're showing an increased ability to raise questions — you guys know this already — about their environment and to describe objects in detail. That's science. And by age 4, children begin to understand that there are multiple ways of thinking and that they can revise their thinking about how the world works. Phenomenal. So our kids are ready for it. And let's not hold them back by thinking they're not ready when they are.

So let's talk a little bit more in-depth about the scientific method and when teachers can use it. And the message here is they can use it throughout the day. It doesn't need to be just a small group activity. And when we think about those steps of the scientific method, they don't have to happen in — you know, sequentially. They can happen just one step at a time, in different order. You can just take prediction and use just that. Get kids practicing the elements of the scientific method, and that would be amazing. So think about things like lunch time. Kids are cleaning up, it's a transition. You can smell lunch coming down the hallway. Ask kids to predict what lunch is just based on what they're smelling. Right? That would be fun. Or as kids are getting ready to go outside — here's another transition question — ask the kids, "Why are we putting on our coats when it's sunny outside?" Right? And then another question that a kid actually asked me when I was visiting in a classroom was, how come salt and sugar taste so different when they look the same?

Dawn: Mmm, that's good.

Vanessa: Oh, good question! And I did not know the answer. [Both laugh] And I said, "I wonder if there's a way for us to figure that out." You know, and so it's about taking those opportunities, planting some seeds of curiosity, and going for it. And so when you think about what to teach, I mean, what kids interact with every day, whether it's salt and sugar, temperature outside, the natural and physical world offers so much opportunity for learning. And even your block area. If we were to follow this grid across, the natural and physical world, think about the physical world in the block area and then think about just motion. There's so much in there about balance, about gravity in setting out blocks. Kids have to know which blocks fit on which blocks, which will topple over, and they'll learn that: trial and error. It's physics! It's science. It's amazing.

So let's stick with the natural and physical world, because it's an endless source of content for kids. Just pay attention. They'll show you what they want to know. So if we wanted to get started in our classrooms, these are some thoughts to put in your head as you're looking at your classrooms. Is it an environment that's rich for exploring? What's in there that gets children curious, thinking about things in a different way? Do teachers offer hands-on activities? This is where those questions spring from and where kids start using their senses and putting together their knowledge. What are teachers doing in small groups? And are they mixing inquiry with the introduction of concepts? Things to think about. And the using of scientific vocabulary. Why not? [Laughs]

Dawn: Why not?

Vanessa: Science is so rich with novel words. If you want to talk about expanding vocabulary, as kids are using tools, they should learn the names of those tools and how they're working. So tools like rulers, thermometers, journals, scales, other words that they would use in science, and of course the words that are involved in the scientific inquiry: prediction, observation. A teacher that I worked with loved the word "hypothesis." [Laughs] And it's great that kids learn to use these words, and they'll use them in context. That's the important piece. So when thinking about materials, you don't have to go out and buy things from Lakeshore, I promise you. That's not a dig on Lakeshore. Any of those companies. You don't need a science kit to teach science. They're nice. They give teachers great ideas to spring from. But walk outside, and you will find an endless supply of science activities that could come from sticks, sand, wind. So think about these, and also think about your families as a source. They're with their kids. They hear the questions they're asking. They may have some insights as well, but they may also have some of the answers the kids are— [Laughs] are asking for. So if there's questions about the differences between salt and sugar, let's ask our parents. [Laughs] Why not? They may have the same curiosity. And especially in tribal programs, engaging our elders. Because sometimes those questions that kids raise have an answer that comes from traditional stories. Why does the wind blow? Why do we have a full moon? Those are some questions that maybe our elders have some insight and some different way to teach children about science. Okay. And I love thinking about our children as engineers. And they really are engineers by the time they're crawling and pulling things.

Dawn: Yeah.

Vanessa: They are problem solving, they're building things, and they're learning how to make things work better. And if you were to spend five minutes in a block area and watch those kids build and rebuild the same structure until they got it just right, they're engineering. And I think if you were to use that word with kids, "You're an engineer," and tell them why. Talk to parents and tell them, "Your child was such an engineer today. [Laughs] A civil engineer at that. He built a bridge today." It'd be fantastic, because that's basically what engineering is. Empower our kids to think of themselves in this way. And that they're using technology. Okay? Because they're using tools to make things work. This is a different frame for thinking about children exploring in something as simple as the block area or at the sensory table. They're engineers using technology. So if you want to be really good at providing science in your classroom, some simple, simple ideas. Follow the lead of the children.

Notice their interests and listen for their questions. And they could come at any time. That salt and sugar question came during breakfast. [Laugh] And what's fabulous, another question that I heard come up during breakfast was about, if raisins were grapes, how did they become raisins?

Dawn: Mmmm.

Vanessa: Right? And so the teacher just sprung on that and said, "Well, you know, let's try to see if we can make our grapes that we're having for lunch into raisins. How would we do that?" I'm like, "Oh my gosh!" So listen for those questions. Provide open-ended materials and add resources to deepen their thinking. And these are books and materials and the teachings from the elders. But when you have open-ended materials especially, it just inspires creativity. You know, there's a place for close-ended materials like puzzles, right? You do it one way, you've done it, you're great. And there's another place for things like PVC pipe and pieces of random wood and sticks, and notice how the children play differently. The questions will definitely be different. And consider your program's school readiness goals, the state standards, and individual child goals when it comes to science.

And I bring this up because when we think about the Head Start Child Development Framework, we think about science and sometimes we think about it only in that one little slice of the pie. But it really, it can — I think it can touch everything in the pie. [Laugh] So we've got logic and reasoning, because kids are thinking about cause and effect, right? Language and development skills — you're introducing new language, children are having opportunities to talk with one another. And approaches to learning — children are being inspired to be curious, to be persistent in their experiments. And when it comes to math skills, children are measuring, they're comparing. There's so much there. If you want to keep going, physical development. Maybe they're working with tweezers. I mean, there's so much opportunity here. So let's think about how science can really build the whole child. And then, finally, teachers can model and teach the scientific method. And this teacher we'll watch in a little bit. He's really got it.

Dawn: Yeah.

Vanessa: He models and teaches it with enthusiasm. And we'll watch Teacher Mitch in a bit.
But in the meantime, I've got another little video for you to watch. It's a simple experiment: just watch and enjoy. [Music] Was that not just the coolest experiment ever?

Dawn: So cool, and very free.

Vanessa: Very free. So easy. Because we all do the sink and float. I think that's one of the standard science activities that teachers do. Kids super get into it. It's fun to chart, and kids have conversation around it. But this kind of puts that whole experiment on its head, right? Because the paper clip will sink, but in this experiment it doesn't. So I want you to think about what you just watched in the video. And for yourself, answer the questions below in the separate chat boxes. What did you notice? What questions do you have after watching that? And what would you like to find out more about with regard to this experiment?

Feel free to answer all or any of those chats for us. We'll give you some time. I asked some of the very same questions. [Laughs] Especially the one about what else could we use? Ooh, Dawn, good question was, was the water warm or cold? That's a good question. I have no idea. What other objects work? How long will the paper clip stay up? I found this video actually just yesterday afternoon, just randomly. I'm like, "Oh my goodness." [Laughs] It blew my mind.

Dawn: Well, and it's such a simple thing.

Vanessa: Very simple, very simple. And then especially if this was paired with the regular sink and float, right? So the kids see it sink the first time, and then you do it on the paper towel and it floats. It raises so many questions. But I have the same questions you guys did. Water warm or cold, et cetera, et cetera. So thank you for participating in that. And the reason why I wanted to do that for you all is I wanted to get you all back in touch with kind of the... the curiosity place, right? The place of wonder that kids come with. When I saw that, my eyes got all big, and I watched it three times in a row, like, "That's not possible!" And that's where kids come with things that for us have become so routine, right? For the sink and float, as simple as it is, as routine as it is for us, kids still come at it with, "Oh my goodness! That's not what I thought would happen," and their eyes get wide. Or the activity that many of us do with the flowers in the colored water and watching the flowers change color.
For kids, that's like, "Oh my gosh.” I can manipulate the world. I can make things change." I think that's amazing. And kids get into that. So that was just for — to get us as adults back into that place of excitement and wonder. So, again, children — what we want to do is encourage children to form their own questions related to their world. And I think we have a video next of a teacher who does just that in a very simple way. It's not a science activity, but this is really, really cool. [Video begins]

Boy: Okay, so no green.

Devin: Hey, Teacher Gabe, why that green? Why this green?

Teacher: That's a wonderful question.

Boy: Hey, look it. No green in here.

Teacher: I know, no color in here. And Devin had a question, how did he make green?

Boy: Use this one, this one, and this one.

Devin: Yeah, this made green!

Teacher: Oh, how did you make it?

Devin: This and that and... with that.

Teacher: Mm, different colors? You put some different colors in it? Okay, let's see. So I'll try...

Boy: Can we have yellow?

Teacher: I'm going to put some yellow on this page. Did you use yellow, Devin?

Devin: No, just the blue and red.
Teacher: Oh, blue and red. Okay. So, let's see. Here's blue.

Devin: I mixed it. I mixed it.

Teacher: Okay, check it out.

Devin: I mixed it.

Teacher: You did it too, huh?

Devin: I mixed it.

Teacher: I'm going to do it right here. Here's red.

Devin: Yeah.

Teacher: Okay, and here is some blue.

Devin: Yeah.

Teacher: And let's see what happens in the middle.

Boy: Teacher Gabe?

Teacher: Yeah, what happened?

Boy: Purple!

Teacher: Purple? That's just like Devin made.

Devin: Yeah.

Boy: How about yellow? Try yellow. Try yellow with... with...

Teacher: Okay.

Boy: With green. Try it with green.

Teacher: Okay, so here's yellow.

Boy: And the... and red.

Teacher: Which one's green?

Boy: No, red.

Teacher: Oh, so yellow and red?

Boy: Mm-hmm.

Devin: Yeah, red.

Teacher: Okay.

Boy: And then you see what happens.

Teacher: See what happens.

Boy: Orange!

Teacher: Orange. [Video ends]

Vanessa: Oh my goodness, every time I watch that video, I get —I almost cry.
It's so perfect in its example of a teacher who is able to really harness the question, follow the child's lead, and really demonstrate some enthusiasm behind finding the answer together. Now this wasn't a small group with ice and which one is going to melt faster, anything like that. This wasn't a science activity per se, but it was still science. And the enthusiasm you saw the children show, and it wasn't even — you know, one boy asked the question, and the other boy jumped in just as excited to find out the answer. And you notice that the little boy made green the first time, and he ended up making purple with the teacher. He just flowed right with it, flowed right with it. So that was an experiment on the spot. And it was just a great example of asking questions, getting kids to ask questions, modeling for children asking questions — he did that.

He used open-ended questions: "What would happen if...?" right? And he encouraged the children to continue to ask questions. And you notice they made orange next. I mean, it was fabulous.
And the little boy's excitement — "Let's see what happens!" [Laugh] — was great. And the other thing teachers can do when kids ask questions is to write them down, find a place to keep them. It's very empowering to see your words on paper, and I'll make this a little bit bigger so you can see some of the questions that kids came up with around turtles under the "wonder" column. Even as an adult, when I go to a training or a conference session, if I'm participating and somebody's up there recording it at the front of the room, I like to see what I said get up there.

Dawn: Yeah.

Vanessa: It's very — it makes you feel good. It makes you feel respected for your thinking. And we can do the very same thing for children. And this is one way to do it. So the other thing that we want to do in the scientific method is to encourage children to observe. And, again, it doesn't have to happen within a science activity. It can be throughout the day. And we can help kids observe by giving them open-ended materials to play with — love this photo — that really encourage kids to use all five of their senses. And to incorporate tools into that. You can see these little girls have magnifying glasses. And recording their observations. Asking children to predict or guess before they answer their question is so fun. And one way to do this without it even having to be a science activity is even during book reading, right? I think I may have mentioned this last week as well, but having kids during a book reading, just show them the cover of the book and ask them what they think is going to happen in the story based on that cover. What do you think is going to happen? As they're reading the story, as it gets closer to the exciting ending, what do you think is going to happen next? And then the key question is why? Right? So getting kids to predict can happen at any time. You want to have — be able to model some "testable" predictions. And I'll show you this blown up in a little bit, but this was an experiment with hermit crabs. Ask kids for their predictions. Ask why. This is a nice repeat of what I just said -- I just want to reinforce it. [Laugh] And encourage kids to think about what they already know. Because kids come in with knowledge from their families, from their communities, and it's important to honor that as well.

So here is a big blow-up of what food hermit crabs will like. And my assumption here is that the kids were the ones who thought up these four different items. So pancakes, lettuce, blueberries, and apples. And then they got to vote what their prediction would be. And what I especially like about this particular documentation is that you can see that the teacher wrote down the names, but I think two kids also signed in their vote as well.

Dawn: Yeah, I love that.

Vanessa: And I'm really curious about whether or not they like pancakes. We also want to provide kids the opportunity to experiment and test out their ideas. So they predicted pancakes. Okay, so we're going to be able to now feed our hermit crab pancakes, right? So that would be the natural follow-up to this. And as kids are experimenting, we can really incorporate some more activity if we allow them to measure those results, get them to write in their journals. And we know it's not going to be "writing" writing, but it's going to be drawing of what they're observing. And I've seen beautiful recording of children's experiments around growing plants, and the one you give a lot of water to and the one you give no water to, what's the difference? And they draw pictures of the little plants. So sweet, and so informative. Because kids can then go back to their own journal and remember, which is so powerful. And then, finally, you can make a graph or chart to really show the whole classroom what they're learning. And here's a blow-up. It's a little bit harder because of the green color, but this is the results of one classroom's sink and float experiment. So these are all the things they tried, what sunk and what floated. They did not do the paper towel with a paper clip. [Laugh]

Dawn: That's the trick.

Vanessa: That's the trick. That's the next one. And then this really is the piece that I find so valuable. All of the steps are important, but I really feel we miss out too often on the discussion portion. We want to

review with kids, what did we find out? You know, why did it happen that way? And then this is a natural segue into the next science activity: what else do we want to know? And this is where those questions spring forth. You could have your whole science planned out for the year just by asking that last question.

Dawn: Yeah.

Vanessa: [Laugh] And it's always following the lead of the children. So now let's watch a video of Teacher Mitch. You may have seen this one before, but it's a good one. [Video begins]

Teacher Mitch: There is something that has legs. There is something that has arms. It's purple and it's blue and it's brown. Can anybody guess what it is? A what?

Child: A human.

Teacher: A human! It is a human! And, look, this is a very special human. This is a very special human because he has something on his back. He is going to show us something. He is going to tell us about something. Do you know what he's going to tell us? "Well, Mr. Mitch." Yes. How are you doing today? "Very good." What is your name? "Tim." Tim? What are you going to show us today, Tim? "I am going to show you about what keeps people on the ground." What keeps us on the ground?

Children: Gravity.

Teacher: Gravity! If we hang string up -- this is a question --

Child: Then gravity pulls it down.

Teacher: If we hang a string up and Tim hangs on the string, what will happen?

Child: Then he'll go down.

Child: He'll go down.

Teacher: You think he will?

Child: Yeah.

Teacher: But what if the string's going across? Will he go across?

Child: No.

Child: Yes.

Child: No.

Teacher: Tim will go where?

Child: Into space.

Teacher: Should I put that on the string? Okay, Tim, here we go. So everyone needs to sit down. So here it goes. Let's see if Tim slides down. What's going to pull him down?

Child: Gravity.

Teacher and children: Five, four, three, two, one. Here we go! Here goes Tim! Ahhhh! Bonk! [Video ends]

Vanessa: He is like this pretty much the entire 3 1/2, 4-hour day with these kids. These are all 3-year-old children. And while you all were watching the video, I mentioned to Dawn that another activity that he does do with the kids is he uses a globe and he talks about where they are on the Earth. You know, where is — this is a program in Washington state — where is Washington state in comparison to the rest of the world? What ocean is near us? Where is the equator? He even says, "That's where Teacher Mitch wants to go on vacation is near the equator. Because why?" And the kids know, "Because it's warm." And so he does introduce things in a very engaging way, which to me is part of the point of sharing this video with you, is that for science to be effective, it needs to be fun for kids. It needs to feel like play. And he certainly does bring in this concept of gravity in a really fun way. I want to play with Tim on a string. And the kids, you could tell, were enthusiastic about it.

So that to me is the main reason why I wanted to show you this video. He is an amazing teacher. But it's making science fun, to make it not feel like a chore, but to feel like something you look forward to doing, for the teachers and for the children. That's just a quote from a physics man. [Laughs] Science is about play, and I think that's important. So, finally, as we're wrapping up our time together, just wanted to remind you all that you do have a majority of this information within the Using the Scientific Method in-service suite. And because you are in the AIAN program, you actually have two versions of this suite. And so you actually have access to more video. So there is the AIAN DVD that you received in the mail from your ECE specialist. And there is also this in-service suite within the big box set binder, that heavy 20-pound thing; it's in there as well. So you actually have access to more video if you would like. In addition, we can certainly send you the link to the paper clip video if you're interested in that. That'd be something easy for us to share with you. And for those that might be interested in the video that was the mixing colors video, that is actually within the Asking Questions in-service suite. Lots of hidden gold and gems within the in-service suites, and it's fun to play around with those videos. So just a reminder that you have that resource to share with your teachers. So I think that's it.

Dawn: That is?

Vanessa: Look at that, the gift of time, seven minutes. You're welcome. [Laughs] Take care, everybody. Thank you so much for joining us, and we look forward to being with you again next month.