Remarks of Susan Nall Bales
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at the White House Early Learning STEM Symposium

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The perspective I bring to this discussion is based on the research conducted by the nonprofit FrameWorks Institute, a group of 20 Ph.D.-level anthropologists, linguists, psychologists, political scientists, and sociologists who are social science storybuilders. We use multiple methods—everything from in-depth interviews to very large quantitative experiments—to document the stories in people's heads on any given topic so we can understand how those narratives enhance or impede policy thinking. We design, test, and propagate new narratives that can be shown empirically to make people smarter about socio-political or scientific issues and to make good social solutions easier to think about. We have done this for 15 years, with hundreds of thousands of informants on issues from early child development (ECD) and mental health to aging, education, climate change, immigration, and housing. And we have taught new stories to neuroscientists and oceanographers, demographers and policy leaders, advocates, educators, and social workers, who have, in turn, changed the conversation on these issues.

The work I present today on STEM [science, technology, engineering, and math] was funded by the Noyce Foundation and is based on 6,350 research participants. But I will also be drawing on work conducted on ECD largely with the Center on the Developing Child at Harvard University that includes about 75,000 participants and on education with 10 major national funders and 28,000 informants. So even though I am going to talk in generalities about the top-level findings, I want you to know that this data set is voluminous and varied.

All of our work is based on the recognition, common across the social sciences, that people think in narrative, remember in narrative, and make meaning fit into a narrative structure. We are storytelling animals.

But how are you to decide what story to tell? It can't just be guesswork. It must be related to what you are trying to do. The goal of all social storytelling is to help people understand enough of the gist of a socio-political problem so that they can prioritize it as a public issue and consider viable alternative solutions. That is what we need to do if we are to help people understand STEM and early learning.

The challenge in achieving that outcome arises from the fact that people are not blank slates. On most social issues, people have a working narrative—or the pieces of one—that they draw upon to process incoming information. So if you want to tell people a new story, you need to understand the one they have been telling themselves. And this is very important: You need to evaluate where it is at odds with the social analysis. What needs to be redirected or remodeled in the narrative in order to allow people to engage differently? That is the essence of strategic storytelling: the recognition that narratives can and should be evaluated empirically.

For FrameWorks, an evaluation strategy has two components. First, can we devise a story that can be shown empirically to marginalize problematic pictures in people's heads and to elevate support for meaningful policies? Everything I will be sharing with you today has been subjected to numerous qualitative and quantitative tests, which we share publicly in reports on our website and in peer-reviewed journals. The second evaluation strategy comes in evaluating diffusion: Has our story seeped into public discourse? Does the Secretary of Education use our metaphor? Is it repeated in the media? Is it encoded in the work of major NGOs or enshrined in legislation? Is our story overtaking the dominant narrative?

The Pictures in Their Heads

Let's start our work today by evaluating the story people are telling themselves about STEM. What is it that a story about STEM needs to overcome exactly? Let me suggest two big problems for us as STEM/ECD communicators that our narrative must address, across groups and across demographics:

- First, most people have a linear and hierarchical model of learning in which the "basics" are learned first—usually through rote learning. So you learn computations through memorization, and math is seen as best addressed in traditional book-based classroom settings. Then you get to graduate to more complex topics like technology and engineering. I think you can intuit here that this understanding is going to be problematic for early adoption of STEM. People may see it as competing with the basics that need to get laid down first. And they will tend to "age up" in their minds the kids who are doing STEM. Now, against this backdrop is some reason for hope in that *science* is understood as best learned in active, hands-on experimentation. So the "science" in the acronym can actually work to communicators' advantage if we can get this way of thinking to map on

to the T-E-M part of the equation. There is communications challenge #1: Disrupt the linear, hierarchy-of-learning story.

- Second, people readily acknowledge that STEM is important, but it is seen as only for certain "kinds" of kids. If you need to exhibit STEM interest and aptitude, then clearly STEM teaching must be reserved for older kids. And if STEM is an inherent gift, not an acquired mastery, then there is no problem of equity inherent in differential access by gender, race, or income. Talent will win out, people say. Moreover, if this is an individual preference, then it makes sense to people to find the gifted students and incentivize them, but not to squander resources on every kid. And if STEM is only about getting a good job and financial success, then some gifted kids will get ahead, and good for them, but it's not *unfair*, nor is it particularly troubling for our society as a whole. So our second communications challenge will be to explain that STEM learning promotes the kind of critical thinking that all kids need and from which our society benefits. And there is communications challenge #2: Disrupt the "some kids, not all kids" story.

There are many, many other challenges, but let's work with these two. How could we tell a story that would overcome these patterns of thinking by giving people better ways to think about STEM? And let's give this challenge a bit of grounding. All of us who are here today want and need to go out into our social networks and tell people about the commitments made today: Why are people supporting STEM? How can you can use the power of narrative—what we know about how stories are composed—to help you engage your audiences, whoever they are? For each aspect of storytelling, FrameWorks has an empirically-tested thinking device or "frame element" you can use to fit in that slot.

A New Mnemonic: STEM

And because I know you have been deluged with information today and must resort to remembering these oral presentations, I am going to make it easier for you by providing *a familiar mnemonic: STEM. Setting, Tension, Explanation, Metaphor.* That's what you need to build into your talks in order to overcome the pictures in people's heads and give them better ideas to think with. Let's examine each briefly.

- First, SETTING. Every story starts with a Setting or orientation. It was a dark and stormy night. Now, you aren't going to use entertainment stories for social policy ends. So your setting is about Why This Matters to Us as a Society, as a Country; why this is a public, not a private, issue. What we know from decades of social science theory and research is that Values orient thinking. Opinion is frame-dependent. Change the Value and you get a different opinion. It's like changing the lens. But it's not just any Value; that's why we test them. And the Value that serves to get people over the problematic "some kids, not all

kids, individual kids' careers and success" orientation is *Future Preparation*. We have to plan now for a complex and unpredictable future. Today's students are our future leaders; we all have a stake in building an education system that fosters the skills we will need to tackle tomorrow's challenges. Supporting quality STEM education for all children is vital to our country's prosperity. One exposure to that Value raised support for the idea that *all* kids are STEM kids by over 4 points.

- Second, TENSION, a plot. Stories have complications and overcome them. Solid *Brain Architecture* is the foundation of a society (Setting). Brain architecture is built by the many back-and-forth exchanges between a child and caregiver; called *Serve and Return*, these are like a game of tennis. But exposure to *Toxic Stress* damages brain architecture. When communities intervene to reduce these adverse exposures for kids, they tip the scale in favor of positive outcomes. That's a short version of the ECD Core Story that FrameWorks and the Harvard Center on the Developing Child have created over time. Setting, tension, resolution. What is the tension in the plot for STEM? Who's the bad guy? Well, there are a couple of them designed by FrameWorks researchers, but let me just focus on one way of framing the problem that has turned out to be very potent: *Charging Stations*. STEM learning opportunities are like *Charging Stations* that power up kids' learning. Some kids are in environments with lots of opportunities from the earliest ages, and they get fluent in STEM. But other kids are in charging dead zones: places without many high-quality learning opportunities they can plug into. The current system is spotty, and that is especially true in the early years. We need to connect all kids to STEM learning so we can keep them charged up. That Metaphor instantly explained for people how systemic factors produce disparities in STEM learning. It got them out of issues of effort and parenting culture and other derailing explanations. So Tension in the plot is critical to your success as communicators.

- Third, a good social policy narrative is EXPLANATORY. It helps people understand a fundamental mechanism or process they couldn't see before. And here, the challenge is to use that understanding of science as hands-on and exploratory to boost the rest of the STEM equation by using an example. We tested several examples and the most potent was about a community garden. Children of all ages and backgrounds can learn a lot of STEM in community gardens, where they acquire critical thinking skills in planning the plots as well as environmental science and plant biology. When they work in teams to analyze what is working and what's going wrong in their gardens, they learn to observe, gather data, and adjust their approach. And it helps them think of themselves as "math and science kids" right from the beginning. That example had a dramatic impact on various aspects of people's STEM thinking, as documented in large quantitative experiments, elevating support for applied learning and informal STEM programs and helping people prioritize experimentation in learning, not just the basics.

- My last component in the story I suggest to you is METAPHOR. Metaphors are devices for thinking. They use what ordinary people already know about how the world works to help them think about a complex issue like STEM learning. *Charging Stations*, *STEM Fluency*—these are metaphors. They help people remember and repeat powerful parts of your story. And because they are tested with hundreds of people, we know what they can do when you use them.

These four story components—your own STEM—can remind you what your story needs to do:

- **Setting**: Use the Value of *Future Preparation* to overcome *Individualist Thinking*, *Basics First*, *For Grown Kids* and *Only Certain Kinds of Kids.*
- **Tension in the Plot**: Use *Charging Stations* to illuminate that this is a problem of differential access, and how this begins in the early years.
- **Explanation**: Use *Community Garden* to make STEM learning tangible and concrete for people.
- **Metaphor**: Use tested Metaphors to your advantage. And help them along by tailoring to your group, using visual devices, and driving home new ways of conceptualizing learning and STEM.

Play Framing Ping-Pong

As one prominent writer has written, "The stories invent us." The STEM story you will tell as you go back in your social, civic, and political circles will lay the grounds for the next innovations in STEM learning. So let's practice! Imagine you are back home, and some group of your acquaintance has asked you to talk to them about your experiences at the White House and your STEM commitment. How do you prepare? If you can predict, you can prepare. The communications research allows you to predict where people are likely to go with your information. So you need to practice framing ping-pong. You do it like this: You think about what it is you want to get across, then you use the research to predict what stories in people's heads are likely to be evoked, and you match that to an element of your story.

Here are four examples of strategic preparation to help you think how you might use research to inform your communications:

Policy science says: Children are born scientists.
The public says: Some children are born scientists, and others not. And then some are encouraged or discouraged to pursue science by their family cultures. Not every child can learn STEM subjects, nor do they need to do so. Not every kid needs to be a math or science kid.

Communications science suggests: Watch a group of very young children who are engaged in planning and planting a community garden. What are they learning? The beginnings of environmental science and plant biology, critical thinking skills, problem solving, trial and error, and more. Every young child can be engaged at this level and can begin to think of themselves as "math and science kids" who can use their skills and knowledge to put food on the lunch table.

Policy science says: Children who engage in scientific activities from an early age develop positive attitudes toward science.
The public says: Children need to learn the "basics" first, before they are able to address more complex STEM subjects. First come reading, writing, and arithmetic. Then kids can decide whether they are ready for STEM.
Communications science suggests: STEM learning opportunities are like *Charging Stations* that power up kids' learning. Some kids live in charging systems with lots of opportunities for learning, while other kids have very few. If we increase the number of STEM *Charging Stations* in kids' environments, we will see more interest and fluency in STEM. Our current system is patchy; this explains why some children never develop STEM fluency, which has significant consequences for their overall learning.

Policy science says: Early introduction to science and math 'talk' helps children build STEM vocabularies and acquire the background or prior knowledge they need for deeper understanding of STEM topics.
The public says: Children need to wait until they can understand complicated scientific concepts. Little kids should be focusing on learning their ABCs.
Communications science suggests: Just as people need to be immersed in a language in order to become fluent, children, too, need to be given many opportunities in many different settings to become fluent in STEM subjects. They need real-world exposures to STEM activities, like planning a community garden. These types of activities help whet kids' appetites for STEM learning and build their skills. When we give *all* children STEM opportunities, they learn to speak fluent STEM.

Policy science says: Preschool math skills predict later academic achievement more consistently than early reading or attention skills.
The public says: Children who are motivated will achieve. Not everyone can be good at math. But everyone can read.
Communications science suggests: Developing STEM skills is an integral part of weaving strong *Skills Ropes*. As we learn new skills, our brain weaves skill strands into ropes that we can use to solve problems, meet challenges and, in turn, acquire new skills. STEM skills are vital in many different kinds of skills ropes. When kids have opportunities to collect evidence and solve scientific problems, they build strong ropes that can be used in many ways later in life.

Tools to Use

Ready to prepare to be a strategic reframer? At www.FrameWorksInstitute.org, you can find a very complete toolkit with videos from our research and flash cards that will help you learn to do this in a deeper way. If you work in informal learning environments, you will want to access the work we've co-created with the Afterschool Alliance and the Afterschool STEM Hub. And if you want to burnish your own communications skills, FrameWorks Academy offers a series of online courses that explain how people think about complex social issues in general, how Explanatory Metaphors and Values work, and how narratives do the work of social movements.