Synthesis: Multiplex Theme January 2020
Broadening Participation Through Community Engagement

Introduction: Striving for a just, sustainable, and culturally thriving society
     The Theme was spearheaded by a remarkable panel of experts: Megan Bang, Professor of the Learning Sciences and Psychology at Northwestern University; Bobby Wilson is CEO and Founder of Metro Atlanta Urban Farm in College Park, GA.; Liz M. Díaz-Vázquez Associate Professor in the Chemistry Department of the University of Puerto Rico, (Rio Piedras); C. Brandon Ogbunu, Assistant Professor in the Department of Ecology and Evolutionary Biology at Brown University, and Carrie Tzou, Associate Professor in science education in the School of Educational Studies and the director of the Goodlad Institute for Educational Renewal at the University of Washington, Bothell. This synthesis draws from their presentations, from their posts on the Theme Discussion, and from the resources that they recommended.

     The STEM field is an important arena for work to create a more just, sustainable, and culturally thriving society, for many reasons:
  • The subjects comprehended within science, technology, engineering and mathematics have much inherent interest for anyone curious about the world;

  • These fields offer proven capacities for positive change in people's lives, and fundamentally these capacities are derived on continuous, grounded inquiry;

  • The STEM fields have significant power within the dominant culture (including political and economic power, as well as other benefits of privilege);

  • Related to this is STEM's history as part of the hegemonic system, the creation and sustaining of the status quo that has favored values, aesthetics, and ways of knowing and acting that maintain various patterns of exclusion and disempowerment for whole communities;

  • The inherently social nature of science, and the other STEM fields lends itself to community engagement and collaboration, and to research and innovation based on community questions and needs;

  • Learning sciences research situated in STEM fields has increasingly recognized the importance of other epistemologies, such as indigenous ways of knowing, in the renewal of patterns of learning, teaching, and action through STEM.

On these considerations, then, the "participation" we are speaking of includes learning, practicing, and using science and the other STEM fields as areas of action, capacity, innovation, shared action, and personal and communal expression.

Identity and community are cardinal dynamics.
     One additional understanding is shared by all the participants in this Theme, which is that identity is fundamental to personal agency and expression. Identity includes a wide range of elements, such as the "environmental self" explored by Marjorie Grene, to self-efficacy as elucidated by Bandura and others, to science and place identity. These different facets of identity are of course mediated by one's community culture and discourse, and have to do not only with who one is, but

also what is the right way of living in the world. In working across boundaries between "mainstream science" and other communities, being explicit about dimensions of identity can play an important role in bridge-building: the dynamics of identity are part of scientists' experience and work, but are rarely shared with nonscientists or with young people learning mainstream science. It thus can be an important factor in each of the strategies that the Theme's panel addressed.

Four strategies for broadening STEM participation through community engagement

1. Desettling STEM

School science tends to send the message that people that you know in your community have Wrong Knowledge with regard to science — that is, "settled science." Paying attention to indigenous and other ways of knowing helps change the framing within which "settled science" can be interpreted, and allows for additional insights about science and STEM as lived experiences.

Thus, one part of positioning STEM to encourage the development of a just and thriving world is to "desettle" science and the other fields. This means changing our practice, and our language, to reflect that science as a process of inquiry, generates more questions than answers. and is a way that enables kids and other people to pose their own questions, and answer them. It also means designing learning environments in ways that help people in navigating across different ways of knowing.

As Brandon Ogbunu said, with reflecting on the Roots project, a conversation about "who I am" can't be grounded just in one dimension. Their project recognized that their participants could be seen as having genetic, genealogical, and intentional selves. The curriculum that they developed for this reason had to be a lot more about providing a framework to view themselves and the world, rather than providing an answer about who they are based on their genetic heritage. Our "heritage" includes also the levels of history and of story that each of us embodies. In engaging with children and other people from non-dominant communities, educators need to understand power and historicity: Remember that many kids' parents and grandparents have experienced science as a tool of epistemic supremacy — de-valuing their communities' knowledge and wisdom, and overlooking the history and costs of that exclusion. "If you're an American of slave ancestry, genealogy is complex and dark, so while for some kids it's fun and engaging, for others it's hard to work with."

Without this awareness, STEM will incorporate new faces, but leave the current power structures in place. So in order to desettle STEM, we need to reckon deeply with people's community lives.

2. Families and communities using science for their own purposes

All learning is cultural. Recognizing this can lead to radical innovations in our approach to STEM learning, especially when STEM is situated in community. The projects highlighted in this Theme tended to flip the usual course by which STEM comes to a community. When a project is centered in the scientist's, engineer's, or educator's world, and then invites communities to participate, this means inviting them into the space defined by, and "owned" by the researchers. The presenters in our Theme have tried to reverse this — as Dr. Díaz-Vázquez said, to define projects in the community and then go to the lab.

This kind of shift is also a pathway towards learning for all. Traditionally, scientists are seen as "the experts," not as facilitators who help communities to address issues they are facing. When researchers are working with communities, it's important for them to discover the community's strengths and work from that. This can help nurture their desire for learning, and see the science in their lives. By listening to them and seeking their knowledge, the science can go better. In this way, the researcher takes the responsibility to make the community into real collaborators, and offer them the opportunity to lead. This stance can also encourage the emergence of the next generation of scientists, because the youth can see meaningful pathways into participation in STEM, that do not

take them out of their communities, but bring new resources and capacities to enrich the community life which forms part of the young people's identities. In doing this, the panelists suggested some other strategies that can bring STEM learning and practices into the community in substantive ways:

1. We could and should seek opportunities to decentralize informal learning outside of institutions, and locate it in places that have other uses as well — and therefore other meanings for the community participants;

2. Design for family learning, that is not construed as parents or communities supporting kids learning school science, but actually is families learning together;

3. Increase access to robotics and computer- based tools including the Internet - again, not just for children, but for learners and makers of all ages — normalizing the use of such tools, and associated expertise.

Finally, a story-centered approach is an example of a strategy that promotes intergenerational learning, and allows for multiple histories, practices, and identities. Projects that incorporate a family design process enable stories to get deeper and more nuanced, and participating families can serve as mentors to each other.

3. Power and privilege

Authentic community engagement requires that participants confront privilege and power from the beginning. Everyone needs access to the table, a seat at the table as a community, and researchers who want to work in community must allow their roles in the partnership to reflect their respect for the community. Cultural markers like academic language can maintain the distinction in status between researchers and community members. Community members need to feel that they have a real stake in the shaping and direction of the project. Evaluation plans should reflect questions and values of importance to the community. Commitment is also important: project members who are from outside the community — for example, investigators who arranged the funding for the project — should take thought about how to make the engagement persist, building a real mutual relationship. A project that engages a community on its own terms, and solely for the lifetime of a grant can feel like an "extractive" relationship: The researchers need something from the community for their own purposes, and once that is achieved, there is no further connection.

4. Transparency and accountability: Keeping it real

Institutions need to understand that we must change the way we work with communities. This means taking the time to build trust, and to take account of the politicized/racialized history of relationships with institutions such as universities. One way that this is accomplished is by "keeping it real" with the community in all aspects of the project. Consider: Do you share the project budget with your community collaborators? Are people from the community being equally paid for their expertise, in comparison with outside experts? Do community members have substantive input to the research plan, and play a substantive role in evaluation? This kind of communication in depth needs to be given the time it needs.

Two-way communication is also a way to empower scientists to communicate science better. STEM communication is both oral and also written, and both modes are of value to all participants. Dr. Díaz-Vázquez told us how their project in Puerto Rico helped develop a community magazine, sharing about the project in a community voice.

Implications for policy makers, researchers, developers

Researchers, policy makers, and developers who hope that their efforts will contribute to a just, sustainable, and culturally thriving society should make sure that their design and implementation of projects reflect the insights of projects such as those featured in our panel and Theme of the Month playlist. You may want to consider:

- In what ways does your project design flip historic patterns of privilege and power in its relationship with its community, and how have you enlisted community members to examine this question?
- In what ways does your project implementation remove barriers to substantive community involvement, in administration, evaluation, and leadership?
- How do your methods and activities give authentic respect to the community's ways of knowing, patterns of conversation, leadership, and values?
- What are ways in which your project seeks intentionally to "desettle STEM," so that the STEM content of the project is seen as a resource for the community to address questions of interest to it, express its values and understanding, and incorporate the many aspects of community identity?

Implications for teacher leaders and other educators

Though much of the theme's discussion and materials has been around out-of-school learning, schools ideally are also part of the community. STEM teachers can exercise real leadership in developing authentic community engagement around their areas of interest. They can examine their own practice and seek to "desettle" the STEM they teach. Hands-on pedagogy, and curricular material developed from questions of community interest, are at best rooted in a focus on ways of knowing about the world we live in. Communities often have their own ways of knowing, teaching, and learning which are integrated with the formation and performance of identity within the community. STEM in schools can recognize and augment these ways of knowing, while adding additional social and intellectual values of its own. Teachers and teacher leaders can learn with and from their students, by cultivating a community frame of mind, and remembering that "all learning is cultural."

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