Shared Practices & Implications from the 2022 NSF ITEST Principal Investigator Meeting

Produced by the STELAR Center

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STEM LEARNING AND RESEARCH CENTER

EDC Education Development Center

NSF ITEST Innovative Technology Experiences for Students and Teachers

CONTENTS

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Introduction

The 2022 PI meeting was held as a thematic working meeting focused on field building and experience sharing. Projects were asked to come prepared to share ongoing/formative experiences about their incomplete work.

During the meeting, projects engaged in sharing and reflection around the meeting themes with the goal of gathering input, getting unstuck, collecting insights, and receiving advice. Projects were asked to reflect on and identify best practices and share how they will incorporate this guidance to strengthen their current project work.

NSF Program Officers developed the meeting themes as a frame in which to showcase exemplary work and to engage the ITEST community in conversation. Each day of the conference featured an over-arching theme, providing a pathway for the conference and building toward the future. The sessions were each designed as a panel moderated by NSF Program Officers, with interactive elements used to engage attendees.

This report is a summary of the three-day event to serve as a reference for ITEST Program Officers, participants, and those interested in building on the work of the community. It includes a capture of the structure and design of the event, summarizes the sessions and topics, and highlights the rich discussions held within sessions. STELAR has synthesized these discussions into a collection of shared practices and implications for the entire ITEST community, to support future ITEST development and to advance the broader field of STEM and ICT education research.

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Shared Practices Identified

During the 2022 Principal Investigator Meeting, ITEST teams discussed and shared practices relevant to ITEST goals:

1. Embrace diversity, inclusion, equity, and access (DIEA) in project strategies, research design, and approaches
2. Develop partnerships that provide career support, community infrastructure, and access to opportunities for equitable STEM education
3. Advance STEM learning and workforce development in areas of national priority and critical emerging technologies

This section presents the highlights of the ITEST team discussions and the shared practices and implications that emerged from those discussions.

1. Shared practices that embrace diversity, equity, inclusion, and access in project strategies, research design, and approaches

The ITEST program is determined to democratize STEM and ICT in pre-K–12 education and increase access for the "missing millions" in systemically marginalized communities. Dr. Jeannine Dingus-Eason, who was the keynote speaker on Day 2 of the meeting, said that this will require "shifts in positionality, iterative research design, and processes as well as a consideration of power dynamics, applied research settings, and interest in intersectionality." Social identities are linked, in part, to group membership. ITEST project teams should reflect the demographics of the communities they partner with. Expanding to new communities (i.e., scale-up) requires learning deeply about those communities and investing in place-based strategies for various project components, such as professional development.

Research design that centers DIEA should be based on literature that discusses how to better engage marginalized groups, for example, through project-based curricula that includes representative role models and culturally relevant and meaningful projects.

Flexibility of project strategies is also critical. Project teams need to listen and reflect, and then be willing to embrace what comes out of that reflection. They should be prepared to shift the curriculum and have flexible plans to adapt to the needs and/or interests of program participants. In one project, for example, significant benefits resulted when the project shifted away from focusing on a computer science (CS) curriculum with culturally relevant components to one that allowed Indigenous cultures to provide the context within which CS concepts were introduced. Lessons learned through this paradigm shift resulted in significant outcomes that benefited not only the project in question, but also other ITEST projects as principal investigators considered the implications of those lessons learned.

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Programs can serve their communities better by involving youth in the design process of their STEM education. Youth advisory councils are a good way to involve youth in designing their STEM education. Employing the Wrong Theory Protocol (Svihla, 2020) fosters ideation by broadening thinking and empathy before participants come up with their own solutions. This process results in students connecting the solutions to their identities. Student interest is triggered when they are supported to make meaningful connections to the content. Note that special populations may require special strategies. For example, using Universal Design for Learning (UDL) and learning strategies for students on the autism spectrum opens the learning experience, which also benefits others. It brings people with different ways of being and thinking into the design process and helps correct for underdiagnosis in certain populations.

Implications

The ITEST community might:

- Ensure that project teams reflect the demographics of the communities they intend to serve
- Invest in place-based strategies
- Base research design on literature that informs how to better engage underrepresented groups
- Be prepared to be flexible and change direction as needed to meet equity goals
- Allow cultures of underrepresented groups to provide the context for learning
- Involve youth in the STEM design process and engage youth through youth advisory councils
- Use Universal Design for Learning (UDL) principals

2. Shared practices that reach out and bring in partnerships that provide career support, community infrastructure, and access to opportunities for equitable STEM education

For STEM education to reach more students, it is crucial to build inclusive partnerships across communities, universities, nonprofits, corporations, and families. However, people and communities are often wary of researchers and those who are outside of their community. Building trust therefore is essential:

- Anticipate how you will build the necessary trust in communities where you may not have strong partnerships.
- Consider bringing in a trusted intermediary organization to provide a neutral playing field.

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- Consider the needs of different populations as you expand geographically. For example, partner with ethnic community-based organizations and seek the support of trusted community leaders to recruit families and participants for the program.
- Involve local mentors and center local knowledge to help tie youths' STEM experiences to the local community.
- Diversify ways to get in touch with and connect with your audience, such as collecting data during home visits.

Partnerships are complex. Acknowledge that your partners are interconnected and have relationships outside of your project. Partnerships, like all relationships, take time. Continuously assess how the partnerships are going and reflect on the vision and mission of the partnership. Honor the contributions of all partners. Create opportunities to ask and answer essential questions, such as:

- What does each partner uniquely contribute to the partnership?
- What are the mutual long-term goals of the partnership?

Building successful partnerships involves dedicated, ongoing relationship-building efforts. Ensure everyone's voice is heard and be aware of your own organization's positionality when working with people.

Implications

The ITEST community might:

- Research elements of successful inclusive partnerships and what partnerships need to do to maintain and deepen inclusiveness and diversity
- Develop and share strategies and experiences in trust building within partnerships
- Explore the role of intermediary organizations as a backbone of partnerships
- Develop strategies to engage families and community organizations in STEM partnerships
- Identify formal and informal power brokers in your community
- Share strategies to engage partners and honor their contributions
- Use the five dimensions of the Research Practice Partnership Effective Framework, quoted below (Henrick et al., 2017), to assess partnerships:
    - Building trust and cultivating relationships
    - Conducting rigorous research to inform action
    - Supporting the partner practice organization in achieving its goals
    - Producing knowledge that can inform educational improvement efforts more broadly

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- Building the capacity of participating researchers, practitioners, practice organizations and research organizations to engage in partnership work

3. Shared practices that advance STEM learning and workforce development in areas of national priority and critical emerging technologies

Today's K–12 students will need to develop the foundational knowledge and skills to live, learn, and work successfully in a world driven by technology. This involves learning about emerging technologies driving discovery and innovation and new skills and dispositions occurring at the intersections of technical and academic disciplines. As we move into the data-driven human-technology frontier, new topics such as artificial intelligence (AI) and the quantum revolution, new terms such as *block chain*, innovations in clean energy, and the science driving climate change will impact not only what students learn but how they learn it. Principal investigators considered these issues and suggested that the following shared practices be noted.

Data literacy and fluency is an important growing core of knowledge that more students need to learn in order to understand the large amounts of data we see around us, to be able to interpret the data, and to then tell the data story to both understand and explain phenomena. Society needs data literate citizens and students, data fluent workers, data technologists, and data scientists to make sense of the large amounts of data to which we have access and to ensure that our nation leads in global discovery and innovation. To accomplish this goal, we need to develop more learning opportunities that integrate data science concepts and principles into the K–12 curricula and provide opportunities for students to engage with data in out-of-school programs.

Working with data increases in importance as it is also foundational to AI work. Understanding this connection, several ITEST projects focus on the foundational AI skills and knowledge that students can develop in grades K–12. One project, for example, works with a concept inventory to measure AI knowledge and the attitudes, motivations, and constructs they are using to measure interest, relevance, and career awareness. Additionally, helping students understand the ethical considerations in AI is important to ensuring a safe and equitable future.

The quantum revolution is changing the way we understand the world around us. As we learn more about the quantum revolution and how the smallest parts of matter move, ITEST projects are working with teachers to provide a grounding in quantum sciences by introducing quantum concepts into K–12 curricula. By using Quantime, for example, K–12 teachers can find activities that introduce the quantum concepts in a single class period. We have learned that there is a cognitive load barrier as students move from concepts about photons and energy levels to more complex knowledge. This barrier requires developing a conceptual progression to ease that burden, which translates into an opportunity for ITEST to develop conceptual and learning progressions in these areas. As

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yet, we have not found a way to measure student outcomes. Instruments are still under development, which also creates an opportunity for ITEST to develop instruments for these emerging fields.

Blockchain is a new and confusing term to many educators. Principal investigators suggest we can bring blockchain into grades K–12 by informing the public, educating the workforce, involving every industry, developing students' capabilities, and conducting research on it.

Clean energy is an emerging field gaining in popularity, especially as school buildings are being retrofitted to conserve energy. Principal investigators suggest that teachers can integrate clean energy education through classroom projects or experiments that address tangible things such as solar panels. They also suggest that in schools where they are installing clean energy technologies, teachers can make the installation part of an educative process.

Implications

The ITEST community might:

- Develop projects that explore emerging technologies that drive discovery and innovation and the foundational skills that can be developed in grades K–12 to get youth started on pathways to emerging career fields and how learning might occur differently as a result of these technologies
- Develop projects (e.g., stand-alone classes both in and out of school as well as the integration of data-rich activities to drive conceptual learning within disciplines) and conduct research on the levels of data literacy and fluency needed to live, learn, and work in a data-rich world
- Develop frameworks and expectations for what students need to know and do with data throughout K–12
- Continue to explore and experiment with what students can learn and do with AI in K–12 grades
- Develop K–12 learning trajectories and assessments of knowledge and skills in emerging fields, such as data science, AI, and quantum sciences
- Redesign physics curricula to help students develop an awareness of, basic knowledge of, and basic skills in quantum sciences
- Conduct research on the impacts of various instructional strategies on the cognitive load needed by students for learning concepts and developing the skills and knowledge in emerging technologies

Additional detail on each of the sessions is included in the Session Summaries below.

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Session Summaries

The session summaries below provide detailed capture of the topics and activities from each session. Each session recording is linked to in the session title, for a listing of all sessions, recordings, and presentations, visit the online program on the STELAR website.

November 1, 2022

Day 1: Welcome and Opening Remarks

Sarita Pillai, Principal Investigator, STELAR, welcomed the ITEST community and NSF leadership affirmed the importance of ITEST for the priorities of NSF and broadening STEM education and workforce to the missing millions.

Chia Shen, ITEST Program Co-Lead, invited the PIs to engage in sessions and with each other, embrace diverse perspectives and society needs, and envision the future of the field and their future work.

Evan Heit, EDU DRL Division Director, and James L. Moore, EDU Assistant Director, reinforced the ITEST work to create accessible, inclusive, and diverse educational opportunities at every zip code and in emerging technologies, through partnerships and with focus on developing the workforce.

Finally, **Wu He**, ITEST Program Lead, gave an overview of the past year's ITEST award portfolio. He called on the ITEST community to (1) embrace diversity, equity, inclusion and access in project strategies, research design and approaches, (2) reach out and bring in partnerships that provide career support, community infrastructure and access to opportunities for equitable STEM education, and (3) advance STEM learning and workforce development in areas of national priority and critical emerging technologies.

Day 1 Keynote: Kumar Garg

Kumar Garg, Vice President of Partnerships and Managing Director of Schmidt Futures, encouraged ITEST members to develop learning opportunities that integrate data science concepts and principles. Garg highlighted this area as a growing core knowledge more students need to learn to understand large amounts of data. Participants submitted questions during the presentation which were addressed in a follow-up webinar held December 8 (webinar recording).

Day 1, Session 1: Emerging Theoretical Concepts, Instruments, and Tools

NSF Program Officer Asli Sezen-Barrie kicked off the session with the trends in dispositional outcomes and constructs ITEST projects have used since 2003.

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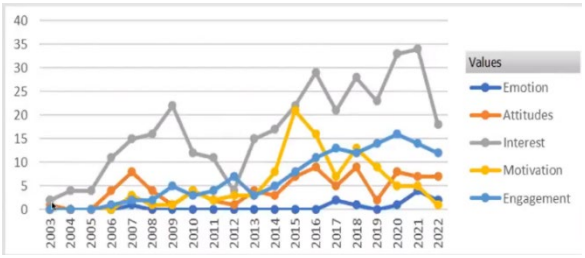
The figure to the right shows a prevalence in interest, decreases in motivation, and increase in engagement. The increase in sense of self constructs indicates it is an emerging construct in the field.



NSF Program Officers Jennifer Noll and Fengfeng Ke moderated a conversation as three speakers shared their work around emerging theoretical concepts, instruments, and tools.

Sherry Hsi, BSCS Science Learning, ITEST Project: Making Waves with Radio

- To promote youth agency, this project worked the Wrong Theory Protocol (Svihla, 2020) design process to foster ideation by broadening thinking and empathy to think about designs that violate the needs of their stakeholders before coming up with their own solutions.
- This process resulted in students connecting the solutions to their identities, because their wrong solutions related to their individual preferences and experiences.

Katherine Moore, Massachusetts Institute of Technology, ITEST Project: Everyday AI

- A discussion on the instruments used to measure a professional development approach to teach middle school teachers about AI and how they are adapting them.
- They mention their concept inventory to measure AI knowledge and the attitudes and motivations constructs they are using to measure interest, relevance, and career awareness.

Kathy DeerInWater, American Indian Science & Engineering Society, ITEST Project: Seeding Innovation

- A year into their grant, this project shifted its framework from a computer science curriculum with culturally relevant components to one that allows Indigenous cultures to provide the context where computer science concepts are introduced.
- They are starting to test this new framework, aimed to increase knowledge and interest in CS in Native learners, primarily girls.

Day 1, Session 2: Technology Integration and Evidence of Learning

NSF ITEST Program Officers Bob Russell, Leilah Lyons, and Fengfeng Ke moderated a conversation with four ITEST Principal Investigators who shared challenges, successes, and affordances related to their work.

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Toni Pence, University of North Carolina at Wilmington, ITEST Project: Virtual Access to STEM Careers (VASC)

- Project summary: An elementary school classroom VR integration and field trip to teach about the sea turtle life cycle in a community close to the beach.
- Challenges and solutions mentioned include disruptions to research schedules, adapting to new technologies and modifying the instruction to account for the young audience that requires classroom management and many scaffolding.

Adam Maltese, Indiana State University, ITEST Project: Role Models in Elementary Engineering Education

- Project summary: Family engineering through informal settings.
- Challenges and solutions mentioned include data collection in homes and diversifying ways to get in touch and connect with your audience.

Chad Lane, University of Illinois at Urbana-Champaign, ITEST Project: Cultivating Creativity to Integrate Computation and Science Problem Solving in Informal Learning

- Project summary: Integrating coding skills and computational thinking into Minecraft to promote computational solutions to solve challenges 20 years from now that can scale and be automated.
- Challenges and solutions mentioned: pros and cons of using Minecraft as a STEM vehicle.

Shuchi Grover, Looking Glass Ventures LLC, ITEST Project: Beyond CS Principles: Engaging Female High School Students in New Frontiers of Computing

- Project summary: High school course using the visual programming environment NetsBloxs. It developed four 9-week modules in distributed computing, cyber security, software engineering and AI.
- Challenges and solutions mentioned include research design based on literature that discuss how to better engage underrepresented groups, such as project-based curriculum, representative role models, and relevant and meaningful projects, and getting schools to take on the course.

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November 2, 2022

Day 2, Session 1: Partnerships

NSF Program Officers Asli Sezen-Barrie and Alicia Santiago moderated a panel discussion about strategies for developing effective strategic partnerships. The conversation focused on multilevel partnerships, implications of bringing partners, what is unexpected, addressing challenges and inequities, developing meaningful partnerships to remove barriers and provide inclusive environments, flexibility, and effective communication.

John Ristvey, University Corporation for Atmospheric Research, ITEST Project: STEM Career Connections: A Model for Preparing Economically-Disadvantaged Rural Youth for the Future Workforce

- This presentation focused on the key constructs and reflections of what it means for the STEM Career Connections project to work with rural community partners to develop an innovative career readiness model for formal and informal learning settings in Colorado.
- Community Partnerships is one of three components of this project, along with the STEM Curriculum and Integrated Career Experiences. Some of their partners include middle school youth, families, local school districts, community colleges and universities.
- How to address inequities:
    - Building a community-based partnership with research organizations
    - Foregrounding and addressing partners' problem of practice.
    - Involving local mentors and foregrounding local knowledge in order to tie youths' STEM experiences to the local community.
- They relied on the following key constructs (Yurkofsky et al., 2020)
    - Bridging: finding ways to connect their work to the demands of the larger system
    - Buffering: protecting their work from the demands of the larger systems
    - Shared Tools: asynchronous and ongoing collaboration
    - Informal Support: assistance during implementation
- Something that has proven successful for them is to have a reflective practice to recognize partnerships like all relationships take time, think about how the partnerships are going, and acknowledge that your partners are interconnected and have relationships outside of their project.

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Steven McGee, The Learning Partnership, ITEST Projects: Adapting and Implementing a Geospatial High School Course in Career and Technical Education Clusters in Urban Settings & Supporting the Scientific Practice of Data Analysis through Creative Investigations of Long-Term Ecological Datasets

- This presentation discussed two projects—the Geospatial Semester scale and spread and Data Jam ecological exploration in Puerto Rico. Both projects address a particular equity challenge for helping more students develop spatial reasoning, which is strong predictor of STEM success, and informing students in Puerto Rico about STEM pathways and offering opportunities to develop these interests, respectively.
- The presenter spoke about the importance of constantly reflecting on the heart and soul of the partnership and answering questions such as what the mutual long-term goals of the partnership are and what each partner uniquely brings.
- The projects use a framework for assessing RPPs with five dimensions:
    - Dimension 1: Building trust and cultivating partnership relationships
      This project has found this dimension to be the most important. They offer more details on how to develop this, including having a couple of people dedicated to fostering the partnership and getting to know as many people as possible in the practice organization.
    - Dimension 2: Conducting rigorous research to inform action.
    - Dimension 3: Supporting the partner practice organization in achieving its goals.
    - Dimension 4: Producing knowledge that can inform educational improvement efforts more broadly.
    - Dimension 5: Building the capacity of participating researchers, practitioners, practice organizations and research organizations to engage in partnership work.

Meseret Hailu & **Eugene Judson**, Arizona State University, ITEST Project: Promoting Aspirations in Science, Technology, Engineering, and Mathematics through Youth and Family Engagement

- This project works with 7-12th grade students and their parents in local refugee communities to promote a breadth of STEM careers.
- They partner with ethnic community-based organizations and seek the support of trusted community leaders to recruit the families that participate in the program.

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- In breakout rooms, the project leaders discussed lessons learned, including using effective communication with stakeholders to help build relationships and establish expectations upfront, and finding a trusted intermediary organization to help outreach to your intended audience.

The panel was followed by a breakout discussion where participants met around their topic of interest, asked questions of the panelists, and responded to guiding questions collaboratively.

Day 2, Session 2: Sparks and Levers – Career Awareness Identity, Engagement and Persistence

NSF Program Officer Joan Walker moderated a panel discussion with experts who have originated some of the most powerful and popular frameworks used by the field today. As ITEST has a congressional mandate to promote career awareness and interest, the program is uniquely positioned to develop and advance theories and measures of interest and emotion. Panelists were asked to share their responses to the following prompts:

1) When you developed your framework, what gaps or opportunities regarding interest were you addressing, and does that gap still exist?
2) Where do you think the field could go now, in relation to sparks and levels, social contexts, developmental levels, and technologies.

Ann Renninger, Swarthmore College
ITEST Project: Hybrid Professional Development to Enhance Teachers' Use of Bootstrap

- This presentation detailed the Four-Phase Model of Interest Development (Hidi & Renninger, 2006; revised 2022) describing learners' behaviors, feedback needs, and feedback wants from the initial interest trigger through sustained efforts that end in a well-developed interest.
- The authors were both researching interest, but arriving at different findings, which led them to explore interest as a continuum.
- The researchers define interest as participation, and measure it in the frequency and depth of engagement, and also whether it's a voluntary or independent engagement, given the opportunity. Positive feelings are present in these phases, but they aren't enough to determine how interested the student is.
    - The model helps us understand that, early in interest development, a person can be supported to have their interest triggered and, if they are supported to make meaningful connections to the content, the person will seek behaviors that will activate the reward circuitry.

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- Educators can make an impact especially in the beginning and, as learners advance through the phases, it becomes self-rewarding to learners to continue to engage.

- Renninger argues that the field should not control for variables such as gender, but rather should focus on the individual trajectories that characterize groups.

Robert W. Lent, University of Maryland College of Education

- This presentation focused Social Cognitive Career Theory, which was based on Bandura's (1986, 1997) general social cognitive theory (SCT) of learning and motivation. Social Cognitive Career Theory (Lent, Brown & Hackett, 1994) adapts general SCT to academic and career behavior with other theories in an integrative framework.
- The authors developed SCCT to address gaps in the research, specifically to answer questions about interests including where they come from, how demographics relate to them, how context affects them, and how they can be nurtured and modified. Its design also addresses gaps about the limits of using interests as guides to choose.
- This model defines interest from the perspective of career psychology as patterns of likes and dislikes, and indifferences regarding career-relevant activities. It recognizes that interests vary along a continuum from global to specific, and that they are a good predictor of choice but not the only motivator. Furthermore, interests don't function by themselves but are a link in a causal chain.
- While SCCT has explored the questions above, but still needs to be applied in longitudinal research to understand how interests evolve. Additional areas to explore include focused intervention research on promoting interest and modifying interest once areas have been ruled out by individuals.

Heather Fischer & **Martin Storksdieck**, Oregon State University
ITEST Project: Developing rural girls' STEM competency and motivation through communicating scientific topics with advanced technology (Girl ARTs)

- Researchers were tasked with quantifying and understanding participation rates in Citizen Science projects. Participation rate is one of the biggest metrics for interest and engagement, but in citizen science programs the participation rate is very dynamic. People have many different reasons for participating in these projects, but there are also many possible end-points.
- The researchers developed the Nibble-and-Drop Framework to provide the language and structure for describing participation dynamics. The framework allows researchers to set reasonable expectations around participation, and then measure

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against their own project to see how people are engaging and whether they are interested.

- The core of this framework is to show that when participants initially sign up for programs, they are exploring and trying to gauge their interest, in what the researchers dubbed the "nibble" stage. Along the way, they might "drop" from the program due to life events or a lack of interest, or they might persist into the "hooked" stage.
- The Nibble-and-Drop framework helps projects understand why initial participation rates might start high but then drop off, and it explores potential onramps and offramps.
- Additionally, researchers discussed the Virtuous Cycle of Affect Engagement and Learning, exploring the pathway to developing deeper interest and engagement. It explores the connectedness of interest, motivation, engagement, learning, and self-efficacy, over time leading to identity.

Jacquelynne Sue Eccles, University of California, Irvine

- Dr. Eccles began by exploring the reasons that girls were not persisting in math courses, which led her to exploring motivation and interest in general. She found that there were both social and personal aspects that lead to engagement and increase their engagement over time.
- Social identities are linked to group membership. People will find a particular area either appropriate or consistent with their gender role identity or inconsistent, depending on their view, or stereotype of what scientists were like. If a girl could not find a space within the scientist stereotype that fit, she may rule out science before engaging or even developing interest.
- She found that of the children who expressed a well-developed interest in math and science, most would describe engagement during out-of-school time. They did not express interest when describing how they were learning math and science in school.
    - Youth with the opportunity to engage in out-of-school time, community activities, or who have parents/families that are engaged in math and science have many more instances to find that initial trigger, and therefore continue to have that interest developed. More youth need opportunities to experience that engagement.
    - Likewise, more work is needed to increase onramps in the classroom, to find a way to trigger that initial interest and increase the likelihood that a young person could be excited about science and math.

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Day 2, Session 3: Diversity, Inclusion, Equity, and Access (DIEA)

NSF ITEST Program Officers Deena Khalil, Lynn Tran & Toni Dancstep conducted a "fishbowl" style conversation between four people from two ITEST projects as they talked about their work with a focus on use of technology to support STEM education for learners with disabilities.

Jessica Hunt & **Alejandra Duarte**, North Carolina State University, ITEST Project: Enhancing Engagement and Conceptual Understanding of Fractions for Students with Learning Disabilities using the Model Mathematics Education Curriculum. This curriculum integrates math intervention strategies to the classroom through a computer game across schools in North Carolina using Universal Design for Learning (UDL).

Wendy Martin & **Ariana Riccio**, Education Development Center, ITEST Project: Developing Abilities and Knowledge for Careers in Design and Engineering for Students on the Autism Spectrum by Scaling Up Making Experiences. This hybrid of informal and formal maker space curriculum prepares students with and without ASD for careers as inventors, designers, and engineers.

The "fishbowl" was moderated by the by DIEA keynote speaker, Jeannine Dingus-Eason. As participants listened to the conversation, they posted their "noticings and wonderings" to our collaborative meeting space, which were then shared by ITEST Advisory Board Member Theodore Chao.

Day 2 Keynote: Reflections on Diversity, Inclusion, Equity, and Access (DIEA), Jeannine Dingus-Eason

Keynote speaker Jeannine Dingus-Eason, Dean of the Feinstein School of Education and Human Development (FSEHD), Rhode Island College, shared suggestions for moving forward and key takeaways to consider in relation to DIEA and STEM.

Dr. Dingus-Eason places a great value on higher education access of Black and Latino students, and she's especially committed to expanding the ranks of K-12 teachers of color. She utilizes an intersectional lens (examining race, culture, gender, familial, and cultural influences) when investigating the professional socialization of teachers specifically African American inter-generational teachers and their work.

Below are excerpts from the keynote session.

- Dr. Dingus-Eason noted the multitude of ITEST projects incorporating and prioritizing the participation and inclusion of K-12 students from underserved and over excluded populations.

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  - The collective work of ITEST serves to demystify the work of NSF and bring the mission to a broader audience in more approachable ways.
  - ITEST's emphasis brings a framework in examining STEM within the social context of schools and communities. By utilizing this framework, it disrupts traditional curricula that has provided opportunity only for those who are privileged.
  - This includes social, educational, and economic policies that had cumulative impacts on who can participate in STEM careers. Due to these historical and standing policies barriers have been created that prevent participation for all in STEM careers.
  - "Genius is not distributed or restricted based on your zip code, but instead genius is providing and cultivating opportunities."
  - ITEST is trying to break through traditional isolation of communities and populations by increasing access and opportunities.
- National Center for Education Statistics (NCES) US K12 Enrollment statistics:
  - Project a 4% drop (enrollment) through 2030 as school aged population is expected to shrink.
  - PreK-8 enrollment nationally is projected to decrease by 5%, with high school enrollment falling by 2%.
  - NCES predicts by 2030 Latinx students will make up approx. 30% of all public-school enrollment.
- Finding the missing millions requires shifts in positionality, iterative research design and processes, and a consideration of power dynamics, applied research settings, and interest in intersectionality.
  - It is necessary that the narrative of who can and who should be involved in STEM must change.
  - Intersectionality is not static.
  - Question that must be considered: How social identities affect how students advance?
  - Race and intersectionality must be understood to advance an upstream solution to expand access and opportunity in STEM.
- Education Trust resource Why Are Black and Latino Students Shut out of AP STEM Courses (2022) include statistics showing that Black and Brown students are left behind.
  - Funding inequities
  - Fewer seats in advanced courses/if courses are offered
  - Teacher training w/instruction of AP students
  - Students purposefully steered away from STEM courses
  - Racialized tracking is a barrier in accessing STEM courses

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- Deficit frameworks are applied to Black and Brown students
    - How do we reframe this pedagogy to expect student success?
        - Identify the gatekeeping mechanisms. Review the data in your school (e.g., drop dates, enrollment, etc.)
        - Student engagement with faculty/Mentoring
    - Intentional recruitment (school and work)
        - Who is on your team? How is intersectionality present on your team?
        - What are the backgrounds and expertise on your research team?
        - Your team should reflect the demographics of the communities of which you want to serve.
- Theorizing is grounding and calls on researchers to engage in an iterative process of what did we learn and what do we need to unlearn.
- Relationship building and being aware of your positionality when working with people.
- People/communities are wary of researchers and those who are outside of their community.
- Be creative when incorporating STEM into school curricula and meet youth where they are to build their interest.

November 3, 2022

Day 3: NSF Townhall

STEM Education Research on Learning in Formal and Informal Settings (EDU DRL) Division Director Evan K. Heit joined a panel of ITEST Program Officers to answer ITEST PIs' questions.

What's the most significant aspect of EHR getting a new name? Put differently, what should result from the change?

- To be transparent to taxpayers about what the funding in our directorate is supporting, NSF renamed the directorate STEM Education.
- We're working on updating solicitations, as is customary, but won't be changing the mission of the directorate.

How can prior ITEST projects request funding through the Chips and Science Act work at NSF to scale successful programs to broaden participation of Black youth and Black educators in STEM and computing?

- While NSF has a broad authorization of what projects it will be able to support in this area, it is still to be determined how much CHIPS and Science funding will be appropriated for ITEST.

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- CHIPS and Science is a national moonshot to advance national capacity in semiconductors, and NSF would love to see more proposals that will broaden participation and representation in this field. It's a national priority for commercial, technological, education and national security priorities.

It seems that there is an increasing focus on CS, cyber, and AI more specifically. Does that focus indicate a preference for projects in those content areas?

- ITEST diversity in methodologies, the communities it engages, and the STEM principles it addresses is its big strength. It is possible to support all the domains that fall under the STEM umbrella, and there's no effort to change that.
- While increasingly future work will involve knowing about technologies like AI and data science, NSF panelists adhere to the public review criteria. One criterion looks for a transformative approach in recognition of systemic inequities. None of the criteria ask specifically if it involves one STEM domain.

To what extent is the application of theory (e.g., interest development theory, social cognitive theory, critical race theory, queer theory) the foundation of ITEST projects? If projects aren't built on theory, then what should the foundation be?

- Theory is the backbone of an entire proposal and is necessary. It makes assumptions explicit and provides rationale to your decisions. Moreover, theory can help you think and reflect about bias in the proposal.
- Theory also ensures you are adding to and enhancing the field. Beyond being theory-driven, your work should be theory-building. While many studies focus on evaluation, it is also natural to think about how to enhance such evaluation to become research to become knowledge of design, implementation or understanding of the context that it is creating meaningful relationship between the theory and implementation in a specific diverse setting.

There has been a lot of information recently about the newly created TIP directorate. What are implications for DRL/EDU, current programs, and possible future directions.

- EDU shares expertise with the TIP directorate, and encourages ITEST members to find partners at their regional innovation engines, which will fund research centers in smaller cities and other regions of the country to spread expertise in knowledge advancement.
- There are a lot of intellectual connections to ITEST in terms of experiential learning for youth and people looking for work.

The language on the newest RFP has an emphasis on partnerships for training and internships. It is not clear how to address this emphasis when working with elementary school children. Do you have any advice or clarification?

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- For PIs solving for the training and internships at an elementary school, you can think about focusing on families as agents that support student interest, finding support in communities, helping students choose coursework selection in secondary school and orient their interests in informal activities.

Day 3, Session 1: Scale-up Experiences, Successes, & Challenges

NSF Program Officer Arlene de Strulle introduced this session by posing questions that can guide your team as you conceptualize scaling your work. Then, Chad Lane (University of Illinois at Urbana-Champaign) introduced four projects at various stages of the scaling process, which shared successes and challenges in scaling their ITEST project work.

Arlene shared the following recommendations before embarking on a scaling proposal:

- Begin as early as possible in your research to consider questions related to future expansion and seek opportunities to test those ideas and aggregate supporting evidence.
- Scaling can occur across schools, grades or geographic regions with diverse populations.
- Establishing a proof of concept or efficacy may not always relate to the conditions most suitable for achieving results in a scaled environment. How do you know when you have sufficient evidence or the right types of evidence that supports scaling?
- Understand the effects of scaling on the intervention and how it may result in modifications and iterations based upon emergent findings.
- Plan for formative corrections as a project expands. There are unpredictable challenges that can emerge during the scaling process as scaling is not linear and requires experimentation.
- Anticipate how you will build the necessary trust in communities where you may not have strong partnerships and consider the needs of different populations as you expand geographically.

Mary Dussault, Smithsonian Astrophysical Observatory

ITEST Project: YouthAstroNet: Research on the scale-up of innovative technology experiences in astronomy and science imaging

- Project began in 2008 and in 2014 received an ITEST grant to adapt the project to an online platform and collect sufficient evidence for a scale up.
- In 2021, they were awarded their scale up grant.
- Successes: Scale up research produces a lot of data. They identified 34 different instructional experiences the students might have had ran a regression model and

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factor analysis to better understand which of these interventions mattered for learning, interest and identity gains.

- Challenges: Adapt to the technology changes along the way, although increasing access to camera phones has helped the project.

Thomas Hammond, Lehigh University & **Kate Popejoy**, Popejoy STEM LLC

ITEST Project: Expanding Socio-Environmental Science Investigations with Geospatial Technologies in High Schools

- Their first ITEST grant involved partnering with one university and one high school to work with 9th graders. Then, their PO recommended they apply for a scale up.
- Now, currently in their 3rd year of scale up, they are working with 3 universities and 6 high schools, at different grade levels. Their project has new complexities given the school type and geographic variety.
- Successes: Using Slack and virtual calls to connect across the project.
- Challenges: Having to adapt their design during the pandemic, new geographic locales and universities as contextual variables.

Todd R. Kelley, Purdue University & **Pauline Chinn**, University of Hawaii

ITEST Project: Teachers and Researchers Advancing Integrated Lessons in STEM (TRAILS)

- While on their first grant, they decided to apply for a scale up because their work demonstrated growth in teacher self-efficacy teaching integrated STEM, teacher STEM awareness and student STEM content knowledge.
- They went from 45 teachers to 90, and are reaching over 10,000 students, and work with 8 faculty across 5 universities and a nonprofit.
- Successes: They used a USDA map to look for geographic areas where to expand, and through literature learned that the best approach to their scale up would be through place-based knowledge.
- Challenges: Expanding to new communities requires investing in place-based PD.

Danya DeFeo, University of Alaska Anchorage Campus & **Lynda McGilvary**, Fairbanks, AK

ITEST Project: Drone Research and Opportunities for Native Elementary Students (DRONES)

- This is not a scale up grant yet. They are on their third grant to prepare for a potential scale up by expanding their research practices and understanding how they can scale their work.
- Successes: Running a comparative across 3 different sites and including mixed methods and surveying more voices.

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- Challenges: Keeping in mind that when scaling they will bring on new people who won't have the institutional knowledge of what works well, so it's critical to study and document the process; waiting to be invited into communities may put pressures on NSF timelines; it can be tough to collect substantial data in smaller communities in addition to having to use instruments that weren't necessarily validated with the population they are working with.

Day 3 Session 2: Emerging Domains

Moderated by NSF ITEST Program Lead Wu He & Co-Lead Chia Shen, this session featured experts from several emerging domains, who presented the core issues and foundational knowledge that K-12 education can incorporate for the preparation of future equitable STEM workforce in the Clean Energies, Quantum and Blockchain Fields.

Clean Energies: Terrence Mosley, Department of Energy Office of Energy Efficiency & Renewable Energy

1. Career maps and K12 engagement resources for one of the fastest growing areas in the US economy.
2. Mosley talked about the Department of Energy's Office of Energy Efficiency & Renewable Energy's interest in supporting K12 programs to offer summer camps and other renewable energy initiatives.
3. Teachers can clean energy education through classroom projects or experiments that address tangible things like solar panels.
4. In schools where they are installing clean energy technologies, make the installation part of an educative process.

Quantum:

Emily Edwards, University of Illinois at Urbana-Champaign:

1. The quantum field will impact many STEM industries like medicine, cyber security, and geology, and there are efforts to build partnerships across government and academia to build a strong educational foundation for teachers and students to enter this industry.
2. There are drafted Quantum K12 Education frameworks in high school computer science and physics. They are working on the high school math and chemistry ones, as well as one for middle school.
3. There's also a need to engage the general public more widely because of its broader impact.

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4. K12 teachers can find activities that introduce the quantum concepts in a single class period through Quantime.

Angela Kelly, Stony Brook University:

1. The Quantum Education for Students and Teachers (QuEST) project invites students for informal school day activities and summer camps and runs teacher professional development to increase awareness and interest in the field.
2. Challenges they have encountered:
    a. Students have limited opportunities to take part in K12 classes where quantum principles are being taught (physics and chemistry). A solution to this is to train teachers first and ask them to run a curriculum with their students before they visit for informal learning.
    b. There's a cognitive load barrier to move from concepts about photons and energy levels to more complex knowledge that requires developing a conceptual progression.
    c. There's not a way to measure student outcomes yet, as instruments are still in development.

Blockchain:

Bina Ramamurthy, University of Buffalo:

1. Children in K12 have an interest in learning about blockchain because they have heard about crypto and NFTs and want to understand what they mean. However, they need formal instruction and training to learn about the policies and aren't exploited in this novel industry.
2. The goal of blockchain has become to build trust in a trustless world, so it can be easily automated. Its economic impact is to build an inclusive economy that brings in those that don't have access to banks.
3. You can bring blockchain into K12 by informing the public, educating the workforce, involving every industry, developing students' capabilities and researching about it.

Kristína Moss Guðrún Gunnarsdóttir, Jobs for the Future:

1. Blockchain has many potential applications yet to be realized at scale. For example, quickly verifying our identity and academic, professional, and financial credentials.
2. The blockchain industry seeks to create privacy, authority, and trust to our systems, which have previously been granted by centralized institutions. Now, we can reimagine our systems of learning and work in decentralized systems.

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Day 3 Keynote: Robert Simmons III

Dr. Robert Simmons III shared insights from Micron Foundation's Chip Camp outreach initiative to broaden STEM education to diverse high school students and answered questions from ITEST PI Members.

Key takeaways:

1. For STEM education to reach more students, it is crucial to build partnerships across communities, universities, non-profits, corporations, and families.
2. Academics can build trust in the communities by helping build programs that aren't research-based and writing grants that can be redirected to support community STEM education work.
3. Micron is developing a VR experience around semiconductors to provide virtual access to proprietary information where location may limit access to factory visits.
4. Programs can better serve their communities by involving kids in the design process of their STEM education through youth advisory councils.

Future Directions:

Micron Foundation has given some thought to the following directions for Chip Camp but has yet to integrate these activities into their program.

1. Semiconductor Exploration: Dr. Simmons shared a desire to include supervised activities for students to take current technology hardware apart and find the semiconductors. A consideration remains how to offer this for thousands of kids.
2. Workforce Development: While Chip Camp offers students a chance to interact with engineers, there's still some untapped opportunity to connect them with apprenticeship opportunities.

Additional details including presentation slides, recordings, and resources shared during the event can found on the STELAR website.

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Conclusion

The 2022 Principal Investigator Meeting engaged the participants in reflection, dialog, and ideation focusing on how the ITEST community might:

1. Embrace diversity, inclusion, equity, and access (DIEA) in project strategies, research design, and approaches;
2. Develop partnerships that provide career support, community infrastructure, and access to opportunities for equitable STEM education; and
3. Advance STEM learning and workforce development in areas of national priority and critical emerging technologies

The meeting discussions generated implications that the ITEST community might consider as we move forward to learn what it takes to educate the next generation—to reimagine teaching and learning to advance new discoveries in STEM.

These implications are offered back to the ITEST community to consider as we craft new research questions and design new programs, and strategies to meet the Innovative Technology Experiences for Students and Teachers program goals.

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Appendix

Appendix A: Agenda

Day 1: Research Methods & Technology Integration - Tuesday, November 1, 12–4 PM ET	
Welcome & Opening Remarks	During this opening session, we will hear opening remarks from NSF leadership on the meeting themes and an overview of the past year's ITEST award portfolio. • Opening: Sarita Pillai, Principal Investigator, STELAR • Welcome from Chia Shen, ITEST Program Co-Lead, NSF • Introducing the new AD: Evan Heit, EDU DRL Division Director, NSF • Opening remarks: James L. Moore, EDU Assistant Director, NSF • NSF ITEST Overview: Wu He, ITEST Program Lead, NSF
Day 1 Keynote	ITEST Program Lead **Wu He** introduces keynote speaker **Kumar Garg**, Vice President of Partnerships and Managing Director of Schmidt Futures, speaks to this year's themes, and shares his perspective on trends and emerging opportunities.
Session 1: Emerging Theoretical Concepts, Instruments, and Tools	NSF Program Officers **Asli Sezen-Barrie, Jennifer Noll,** and **Fengfeng Ke** will introduce three ITEST Principal Investigators as they share their work around emerging theoretical concepts, instruments, and tools. Each brief presentation will be followed by a Q&A session and an opportunity to brainstorm collaboratively online using virtual stickies to exchange ideas. Presentations by: • Sherry Hsi, BSCS Science Learning • Katherine Moore, Massachusetts Institute of Technology • Kathy DeerInWater, American Indian Science & Engineering Society
Session 2: Technology Integration and Evidence of Learning	NSF Program Officers **Bob Russell, Leilah Lyons,** and **Fengfeng Ke** will introduce four ITEST Principal Investigators who will briefly share challenges, successes, and affordances as it relates to their work and pose questions for one another and for the audience to consider. The conversation will continue in two breakout discussions where participants will have the opportunity to respond to guiding questions around their topic of interest and brainstorm collaboratively online using virtual stickies to share ideas. Presentations by: • Toni Pence, University of North Carolina at Wilmington • Adam Maltese, Indiana State University • Chad Lane, University of Illinois at Urbana-Champaign • Shuchi Grover, Looking Glass Ventures LLC
Day 2: Impact Generation - Wednesday, November 2, 12–4 PM ET	

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Session 1: Partnerships	NSF Program Officers **Asli Sezen-Barrie** and **Alicia Santiago** will moderate a panel discussion of four ITEST Principal Investigators as talk about strategies for developing effective strategic partnerships. The conversation will focus on multilevel partnerships, implications of bringing partners; what is unexpected; addressing challenges and inequities; developing meaningful partnerships to remove barriers and provide inclusive environments; flexibility; effective communication. The panel will be followed by a Q&A session and a breakout discussion where participants will have the opportunity to respond to guiding questions around their topic of interest and brainstorm collaboratively online by using virtual stickies before bringing main ideas back to the larger group. Presentations by: • Meseret Hailu & Eugene Judson, Arizona State University • John Ristvey, University Corporation for Atmospheric Research • Steven McGee, The Learning Partnership
Session 2: Sparks & Levers: Career Awareness, Identity, Engagement and Persistence	NSF Program Officer **Joan Walker** will moderate a panel discussion of five ITEST Principal Investigators as reflect on essential questions around the topic. Speakers have originated some of the most powerful and popular frameworks used by the field today. The conversation will address several essential questions that advance the field today. The panel will be followed by a Q&A session. Presentations by: • Martin Storksdieck, Oregon State University • Jacquelynne Sue Eccles, University of California, Irvine • Ann Renninger, Swarthmore College • Heather Fischer, Oregon State University • Robert W. Lent, University of Maryland
Session 3: Diversity, Inclusion, Equity, and Access (DIEA)	This session will be a conversation between four people from two projects as they talk about their work with a focus on use of technology to support STEM education for learners with disabilities. NSF POs will moderate this discussion with facilitation by DIEA keynote speaker, Jeannine Dingus-Eason. The conversation will be followed by a Q&A session. Moderated by NSF ITEST Program Officers **Deena Khalil, Lynn Tran & Toni Dancstep,** and day two keynote, **Jeannine Dingus-Eason**. Presentations by: • Jessica Hunt, North Carolina State University • Alejandra Duarte, North Carolina State University • Wendy Martin, Education Development Center • Ariana Riccio, Education Development Center

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Day 2 Keynote: Reflections on Diversity, Inclusion, Equity, and Access (DIEA)	Keynote speaker **Jeannine Dingus-Eason**, Dean of the Feinstein School of Education and Human Development (FSEHD), Rhode Island College, will share suggestions for moving forward and share key takeaways to consider in relation to DIEA and STEM.
Day 3: Moving Forward - Thursday, November 3, 12–4 PM ET	
NSF Town Hall	The NSF Town Hall session was hosted by EDU DRL Division Director **Evan K. Heit** with panel of ITEST Program Officers.
Session 1: Scale-up Experiences, Successes, & Challenges	NSF Program Officer **Arlene de Strulle** and guest speaker **Chad Lane**, University of Illinois at Urbana-Champaign will moderate a panel discussion of seven ITEST Principal Investigators & Co-PIs as they share successes and challenges in scaling their ITEST project work. The panel will be followed by a Q&A session and a breakout discussion where participants will have the opportunity to respond to guiding questions and brainstorm collaboratively online using virtual stickies to brainstorm and exchange ideas. Presentations by: • Mary Dussault, Smithsonian Astrophysical Observatory • Thomas Hammond, Lehigh University • Kate Popejoy, Popejoy STEM LLC • Todd R. Kelley, Purdue University • Pauline Chinn, University of Hawaii • Danya DeFeo, University of Alaska Anchorage Campus • Lynda McGilvary, Fairbanks, AK
Session 2: Emerging Domains	NSF ITEST Program Lead **Wu He** & Co-Lead **Chia Shen** will moderate as we hear from five experts as they present on the core issues and foundational knowledge that K-12 education can incorporate for the preparation of future equitable STEM workforce. Each brief presentation will be followed by a Q&A session. Presentations by • Terrence Mosley, Office of Energy Efficiency & Renewable Energy • Emily Edwards, University of Illinois at Urbana-Champaign • Angela Kelly, Stony Brook University • Bina Ramamurthy, University of Buffalo • Kristína Moss Guorún Gunnarsdóttir, Jobs for the Future
Day 3 Keynote	Keynote speaker **Robert Simmons III**, Head of Social Impact and STEM Programs, Micron Technology, will discuss outreach initiatives designed to expose and attract diverse high school students and first-year college students to STEM. This presentation will be followed by a Q&A session.

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Appendix B: Keynote Speaker Bios

James L. Moore, Assistant Director, Directorate for STEM Education (EDU)

As a member of the executive leadership team at the National Science Foundation (NSF), Dr. James L. Moore III is the Assistant Director for the Directorate for STEM Education (EDU). With an annual budget of over $1 Billion and personnel oversight for nearly 200 employees, he serves as the senior leader for EHR, which supports science, technology, engineering, and mathematics (STEM) projects focusing on K-12 education, undergraduate and graduate education, workforce and human resource development, and learning in formal and informal settings. Prior to his NSF appointment, Dr. Moore served, for over five years, as the university's vice provost for diversity and inclusion, chief diversity officer, and leader of the Office of Diversity and Inclusion (one of the nation's oldest, largest, and most comprehensive office of its kind) at The Ohio State University. From 2015 to 2017, he served as a program director for Broadening Participation in Engineering in the Directorate for Engineering at NSF, and, during that time, he was one of the program directors who helped launch the highly acclaimed, cross-directorate, NSF INCLUDES, a $100 million plus national broadening participation in STEM initiative.

Evan K. Heit, EDU DRL Division Director

Dr. Evan K. Heit is Division Director within the Division of Research on Learning in Formal and Informal Settings (DRL) in the Directorate for STEM Education (EDU). Since coming to NSF in 2013, he has played leadership roles in programs related to education and broadening participation research, convergence research, the future of work, and neuroscience. Dr Heit holds a PhD in Psychology from Stanford University and undergraduate degrees in Computer Science and Psychology from the University of Pennsylvania. Prior to coming to NSF, he was a founding faculty member at the University of California, Merced.

Wu He, ITEST Program Lead

Wu He is managing education-related proposals and awards in areas of data science, computer science, cybersecurity, and information technologies.

He is a Program Director at the National Science Foundation in the Division of Research on Learning in Formal and Informal Settings (DRL) in the Directorate for STEM Education (EDU). He was a full professor of information technology in the Department of Information Technology & Decision Sciences, Strome College of Business at Old Dominion University.

He has been the principal investigator or co-principal investigator of grants totaling over $3M funded by National Science Foundation and other federal agencies. He is also the Editor-in-Chief of Information Discovery & Delivery and Associate Editor of Behavior & Information Technology.

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Chia Shen, ITEST Program Co-Lead

Chia Shen serves as Program Director Division of Research on Learning in Formal and Informal Settings (DRL) in the Directorate for STEM Education (EDU).

Chia was Senior Research Fellow and Director of the SDR Lab at the School of Engineering and Applied Sciences at Harvard University. Her lab conducted research in areas of HCI (human-computer interaction), interactive and tactile visual learning, large data visualization, and multi-touch collaboration. She was the PI of the NSF-funded multi-institutional Life on Earth project (NSF DRL#1010889)

Kumar Garg, Vice President of Partnerships, Managing Director of Schmidt Futures

Kumar Garg helped shape science and technology budget and policy priorities for the Obama Administration for nearly eight years in the White House Office of Science and Technology Policy, and drove progress on topics ranging from education and workforce issues, biotechnology, entrepreneurship, space, advanced manufacturing, broadband, nanotechnology, behavioral sciences, digital media, incentive prizes, and broader innovation policy.

In particular, he led the Obama Administration's efforts to bolster science, technology, engineering and math (STEM) education, including development of major budget and policy initiatives in the State of the Union to train 100,000 excellent STEM teachers and bring computer science to all K-12 students, development of the Educate to Innovate campaign with over $1 billion in in-kind and philanthropic investment, and creation of iconic events such as the White House Science Fair.

Prior to his time in government, Kumar worked on behalf of parents and children seeking educational reform as an education lawyer and advocate. Kumar received a B.A. from Dartmouth College and a law degree from Yale Law School.

Jeannine Dingus-Eason, Dean of the Feinstein School of Education and Human Development, Rhode Island College

Dr. Jeannine E. Dingus-Eason serves as Dean, Feinstein School of Education and Human Development at Rhode Island College. As a first-generation college graduate, Dingus-Eason places great value on higher education access for Black and Latino students. She is especially committed to expanding the ranks of k12 teachers of color. In her previous professional role, Dr. Dingus-Eason served as Professor and Program Director of the Executive Leadership Doctoral Program at St. John Fisher College.

A graduate of the University of Washington (2003), Dr. Dingus-Eason has published articles in educational research journals including Teachers College Record, Urban Education, and International Journal of Qualitative Studies in Education, to name a few.

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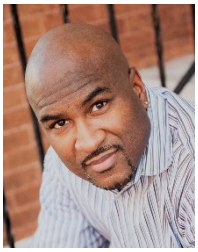
Her research interests include the professional socialization of teachers, specifically, African American intergenerational teachers, examining familial and cultural influences as well as the intersections of race, class, and gender on their work. For this area of research, Dingus-Eason earned a Spencer Pre-Dissertation Fellowship. Currently, her research focuses on bridging historical and contemporary contexts of African American education in the urban North, as demonstrated in her study of African American teacher recruitment to the North. She is also engaged in research on mentoring among Black women leaders in higher education. Her current research interest is Black mothers of sons with autism, specifically examining advocacy and socialization at the intersections of race, class, gender, and disability.

Dr. Dingus-Eason is a former English teacher in the Rochester City School District and served as founding board president for a charter school. She also worked with TRIO Programs including Upward Bound and the McNair Scholars Program. She is an active member of Delta Sigma Theta Sorority, Inc. and the Greater Providence Chapter of the Links, Inc.



Robert Simmons III, Head of Social Impact and STEM Programs, Micron Technology

Robert Simmons III, EdD is the Head of Social Impact and STEM Programs for Micron Technology, and a Scholar in Residence and Scholar of Antiracist Praxis in the doctoral program (educational policy and leadership department) at American University. As a noted scholar on STEM equity, urban education and race, Dr. Simmons teaches doctoral courses on race & racism in society and schools, as well the ways in which social media is a tool for activists and movement building. As a member of the Diversity Scholars Network at the National Center for Institutional Diversity at the University of Michigan, Robert 's research for the last 15 years has focused on racial equity in STEM and the lived realities of historically marginalized communities across multiple K-12 contexts. More specifically, he explores the experiences of Black students and teachers, equity in STEM, as well as the lived experiences of Black fathers.

Dr. Simmons is a partner in the nationally recognized DEI firm—Equity and Beyond, a blogger with Philly's 7th Ward, and a co-host of the 3XDope Podcast. Robert has delivered workshops and keynotes throughout the United States and Europe, and been featured on CNN, the Kojo Nnamdi Show (DC), the Marc Steiner Show (Baltimore) and the Pulse with Karen Dumas (Detroit)—as well as other media outlets in Detroit, Los Angeles, and Washington DC.

During his career, Robert has served in senior leadership roles in the nonprofit sector and a large urban school system. As the CEO of an operating foundation and network of charter schools in Washington DC that supported incarcerated youth and young people pushed out of schools and into alternative education settings, Robert also served as the first Chief of Innovation and Research in the District of Columbia Public Schools (DCPS). Prior to joining DCPS, Dr. Simmons was the Director of the Center for Innovation in Urban Education and Institute for Urban Catholic Education at Loyola University Maryland. As a tenured associate professor of Urban Education and Science Education, with a joint appointment in African/African American Studies, Dr. Simmons served as a Research Associate at the Baltimore Education Research Consortium at Johns Hopkins University. Robert has

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authored over 50 publications, focusing on race and racial justice, as well as equity, diversity, and inclusion.

A former middle school science teacher in the Detroit Public Schools, Robert was nominated twice as the Walt Disney National Teacher of the Year and once for the Whitney and Elizabeth MacMillan Foundation Outstanding Educator Award. As a fellow with the Woodrow Wilson Fellowship Foundation and the Fulbright Memorial Fund, Robert traveled to Costa Rica and Japan to study educational systems and conduct environmental research in the rainforest.

Currently, Robert serves on the boards of the Latinx Education Collaborative and Reaching At Promise Students Association. Selected for the Outstanding Alumni Award from the College of Education and Human Development at Western Michigan University and the BE Modern Man Award from Black Enterprise, Robert has dedicated over 20 years of his professional life to supporting urban youth, their families, and the community.

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