Partnering for Equitable STEM Pathways for Youth from Underrepresented Communities

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ABSTRACT: Access & opportunity in STEM remain limited for youth from historically underrepresented backgrounds in the US & UK. We present findings grounded in Participatory Ethnographies into STEM pathways, highlighting how youth participate in ISL across time and settings in equitable and transformative ways, and practices that ISL practitioners engage in towards supporting pathway authoring. We take a pathways lens to highlight the multiple directions one may take through a particular ecology towards a wide range of outcomes beyond the STEM career, such as STEM agency and identities. Our study involves middle-school youth and ISL practitioners in four cities (Lansing, MI & Portland, OR; London & Bristol, UK).

Our Commitments

Equity & Justice – we will produce new knowledge & practices to close the gaps in STEM

Participatory & Collaborative Approaches – the *voices of youth* & *practitioners* are central to re-imagining ISL knowledge & practices

Why Equitable and Consequential Pathways?

Justice-oriented

Valuing ISL participation as a way to **position youth and communities with agency and authority** – not just to serve the STEM pipeline
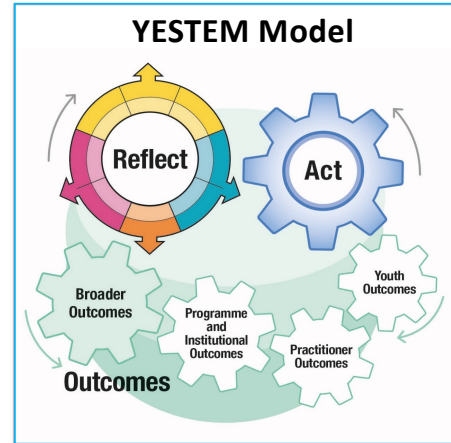
Challenging power structures which limit STEM engagement
Youth from non-dominant communities unfairly positioned as outsiders and non-experts in STEM
- **Macro level**: institutional practices & societal narratives
- **Micro level**: classroom/program activity & peer interactions

Layered power dynamics across settings & time.
How equity pathways matter in very real ways to youth and why we need to see them from different perspectives

Partners:

London
- UCL
- Hanwell Zoo
- STEMettes

Bristol
- UCL
- We the Curious
- KWMC

Lansing, Michigan
- U of M
- MSU
- Impression 5
- Boys & Girls Clubs

Portland Oregon
- Institute for Learning Innovation
- OMSI
- Girls Inc.

Methods: Designing for Equitable Pathways

Strand 1 — Youth Ethnographies & Surveys

2,784 survey responses (1,874 UK and 910 US)
61 youth portfolios (36 UK, 25 US)

19 ISL practitioners (8 UK, 11 US)

Strand 2 — Practitioner Ethnographies

Testing and refining equitable practices across **7** ISL sites (4 UK; 11 US programs across 3 US sites)

Strand 3 — Design-Based Implementation Research

Strand 4 — Outputs and Dissemination

Sociological Approach
- STEM engagement through interaction of 'habitus', capital & field
- Science capital plays roles in shaping expressions of science identity
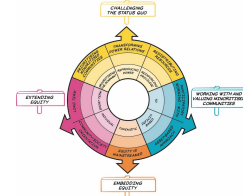- Capital does not have inherent value – value is shaped by the field.

Culture-Practice Approach
- Engagement in STEM shaped through Actions/Interactions made visible by: Discourses, Practices, Tools & Resources, Norms & Routines
- Participation shaped by intersections of local practice and systemic narratives
- Involves movement of ideas, tools & resources towards new learning outcomes and identity

YESTEM Model

Core Equitable Practices are pedagogical practices that support youth STEM learning and engagement by disrupting/transforming power, & valuing youth, families & communities. When enacted over time, they support equitable outcomes.

Core Equitable Practices + Equity Compass work hand-in-hand to support justice-oriented outcomes ISL.

Practice	Definition
Recognizing	Being explicitly and publicly aware of the power of cultural knowledge and practice youth bring to STEM learning spaces, and of youth identity, agency, and expertise in STEM.
Re-seeing and Re-shaping	Building new possibilities for youth engagement in ISL through relationship building among youth, educators, space, and resources.
Co-designing	Collaboratively creating experiences, artifacts, space and desired outcomes.
Reclaiming	Fostering community dialogues and asset mapping towards creating a visible, enduring presence, disrupting and transforming what counts as STEM in the learning environment through how it's represented socially, spatially and discursively.
Shifting Narratives	Purposefully challenging and changing stories about what counts as STEM, who does STEM and how STEM ought to be done, opening up opportunities for youth to be recognized and valued for pursuing STEM experiences on their own terms.
Critically Being With	Slowing down and staying in the moment-in-action, to allow critical dialogue around inequitable classroom practices, interactions in the here-and-now and towards imagined futures.
Embracing Humanity	Valuing individual members of the teaching and learning community as fully human: as just who they are, not who they are expected to be.
Authority Sharing	Offering youth opportunities to be an expert/authority because of who they are and what they know. Giving up the centrality of adult-authority and traditional forms of STEM-authority. Supporting new forms of authority that center and amplify hybrid expertise.

REFLECT: Equity Compass

Equity Compass helps us to:
- Recognise and think about key dimensions of equity/social justice
- Use reflective questions to guide thinking
- Consider how equitable practices and outcomes are
- Map where we are – and map our progress (moving from inside outwards)

ACT: Core Equitable Practices

What is the issue?
- Access & inclusion, while important, are insufficient
- Pedagogical practices are needed to support youth rightful presence
- Justice requires action
- ISL educators' practices play an important role in whether and how youth are welcomed into STEM
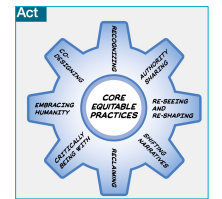
Enactment Support

Core Equitable Practices Bundles
- Individual Practice Insights
- Educator Talk Moves
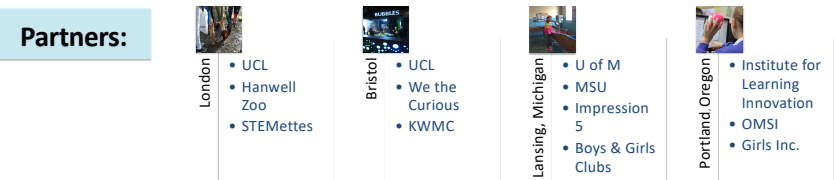- Youth Bids
- Practical Measures
- Design Guide
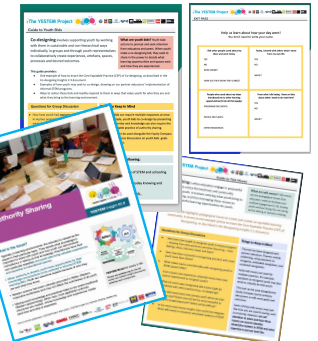
Recognizing
I remember last week when you [Ms. M] asked if anyone knew how to sew? I raised my hand and other kids did, too. You said, "Look around and see everyone with their hands up? They are experts at sewing and can help us today." That made me feel included because it was important and felt good. My auntie taught me how to sew, and when I could help others I got to know them better and make new friends."
- 12 year old youth

Embracing Humanity
When I first thought about this, I had no idea where to begin. Someone suggested to start with myself and make it visible, so I started calling out my mistakes, telling stories from my life related to topics at hand, and asking learners to tell me theirs. Initially I felt like I was diminishing my authority in the space by making myself appear more human, but the mutual respect that got built meant that I didn't need that "authority" most of the time. Learning is about lowering their barriers, testing your ideas, and changing your picture of the world. *If learners don't feel safe to be themselves, then how could they do any of that?*
- Science Center Educator

Critically Being With
"It just felt like [a] school assignment. You write all this stuff, and in the end it doesn't really matter. No one reads it. But then when I could paint my ideas, not write words about myself, and that could be an example, that felt different... like being me was good enough."
- 12 year old youth

Co-design
I know there is a limit to how far "putting yourself in someone else's shoes" can take you. Kids know themselves, their desires, their dreams, and their ideas. We need that expertise. When we design youth programs and spaces, I know it will be more joyful but also higher quality and more effective if *youth partners have a role in the design process. Youth leadership in co-design doesn't just help youth. It helps everyone.*
- Community Center Educator

Shifting Narratives
"The racist stereotype is that Black people are not listening to science. But that is not true. Maybe it's the other way around, like science is not listening to us. I just wish that people could see what I could do, like what I am doing at home. Making homemade hand sanitizer, making masks, caring for my elders. I don't want to act White. I don't want people to tell me I'm not White enough. I want you to know how I feel as a young, Black girl in America and in STEM. I want to feel like I can be me in STEM and have that celebrated."
- 15 year old youth