



Decolonising STEM Education

Dr Meghna Nag Chowdhuri
Research Fellow
IOE, University College London

STEM participation and social justice

www.ucl.ac.uk/ioe-sciencecapital

Our projects	Details
ASPIRES @ASPIRESscience	Longitudinal study that tracks children and their STEM trajectories in UK
YESTEM @yestem_UK	International research-practice partnership focused on understanding and supporting equitable practice in informal STEM learning.
Making Spaces @M4kingSpaces	International collaboration to understand and develop equitable practices in maker spaces
Primary Science Capital @PrimarySciCap @Science_capital	Collaborative research to develop justice-oriented science teaching pedagogies for primary and secondary schools in UK

Science education, colonialism and social injustice

- Educational injustices are not new
- Yet, there is more urgency – not only brought about by COVID but also as foregrounded by BLM, environmental emergency, and many others
- Important opportunity for re/imagining decolonial (science) education for sustainability and justice

What is (colonial) Science and science education?

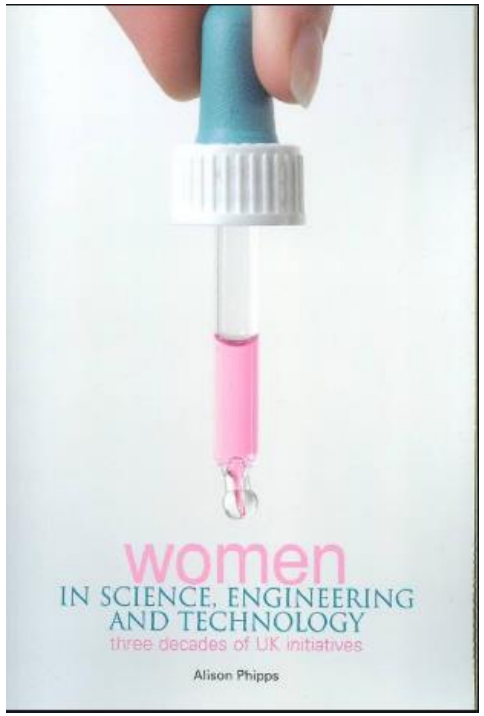
- What we ‘know’ as science (*Euro-centred science has become the ‘canon’; ‘other’ knowledge/s viewed as ‘ethno’ knowledge*)
- How we ‘know’ (*colonial research practices have contributed to the production of scientific knowledge*)
- How we teach what we know (*methods of teaching and learning are themselves developed to safeguard the power of this ‘science*’)

What is (decolonial) Science and science education?

- *What*: Exposing and visibilising the colonial nature of currently powerful science
- *How*: Challenges and broadening the ways science is ‘produced’ and ‘reproduced’
- ***Teaching*: Challenging and reimagining how we teach and learn ‘science(s)’**

The mainstream STEM ‘participation problem’

- Uneven participation in physics, maths and computing relative to other STEM subjects in higher education
- Need to broaden the gender, ethnic and social class profile of STEM students post-16 (eg. Physics and Engineering)
- Interventions have had little lasting impact
- Key priority area for the UK government and other Western developed nations



World news story

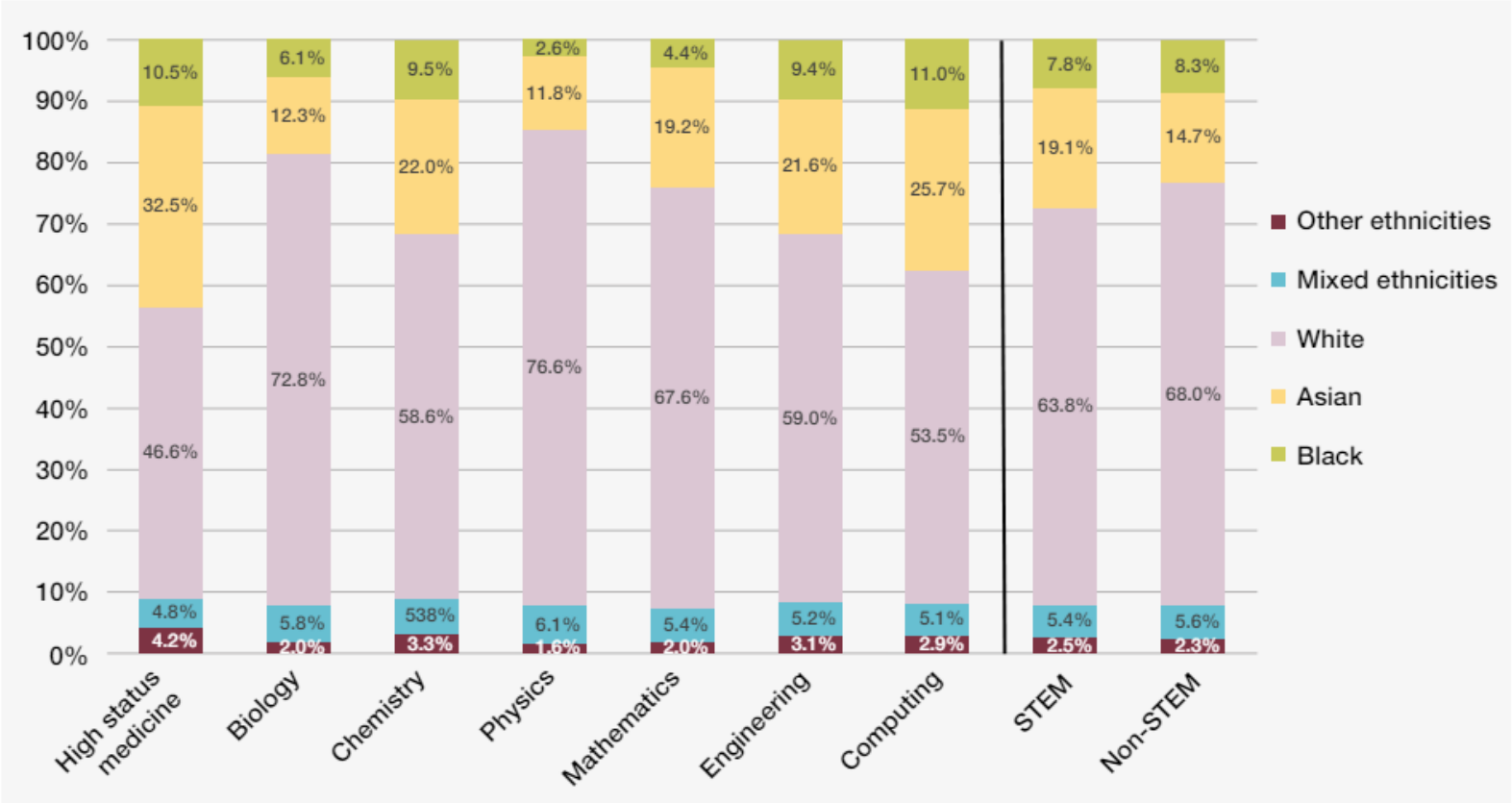
UK funds projects to promote STEM education for girls

SCIENCE GRRL

WISE

Racism and STEM participation

Figure 5: Breakdown by race/ethnicity of first-year undergraduates in England 2020/21



- Racially minoritised students tend to record higher rates of non-completion than White students. In 2019/20, 5.1% of White students left their degree with no award, compared with 8.4% of Black students.

https://discovery.ucl.ac.uk/id/eprint/10181968/1/ASPIRES3%20Main%20Report.pdf

The challenge for STEM ‘participation’: *blaming the student*

- Despite massive investments of time and resources to widen (and increase) participation, science/ STEM participation remains dominated by the privileged (e.g. White, male, middle-class, able-bodied, etc.)
- Most efforts have focused on changing young people in some way, often through deficit models (e.g. to change/increase a perceived ‘lack’ of interest, motivation, awareness, knowledge)
- But our research suggests that (i) lack of interest and motivation is not the main issue and (ii) schools and science education play a role in excluding and dissuading students from science

Structural (and intersectional) racism and inequalities impacting STEM participation

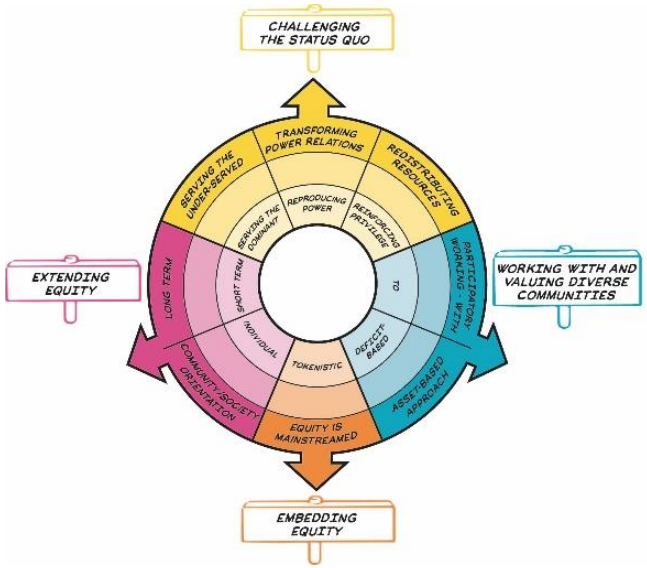
Intersectional structural inequalities of gender, race and social class:

1. Educational factors and practices
2. Capital-related inequalities
3. Dominant educational and social representations of science

Full (2019) report:
https://discovery.ucl.ac.uk/id/eprint/10092041/15/Moote_9538%20UCL%20Aspires%202%20report%20full%20online%20version.pdf

Tools for practice

- Two tools: the *Equity Compass* and the *Science Capital Teaching Approach* (SCTA)
- Both focus on changing practice (the field) not the young person
- Its not (just) what you do - but the way that you do it!
- Underpinning values and mind set will determine the equitable potential of your practice



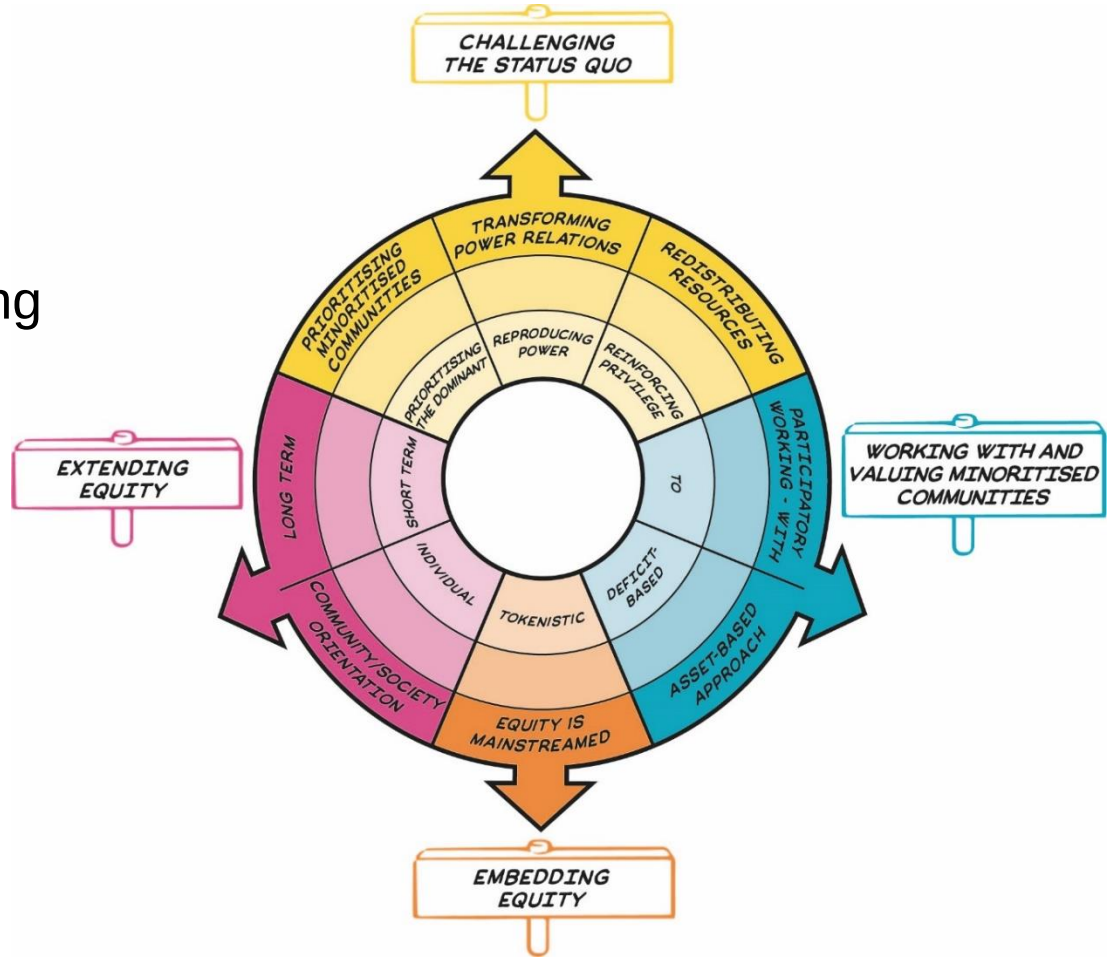
The Equity Compass: background

- Developed in Youth Equity + STEM project (2017-2022), 5-year UK-US research-practice partnership
- Collaboration with informal STEM learning organisations: Stemettes, Hanwell Zoo, We The Curious, Knowle West Media Centre
- Academic research team, informal STEM learning practitioners and young people aged 11-14

The Equity Compass

Equity Compass helps us to:

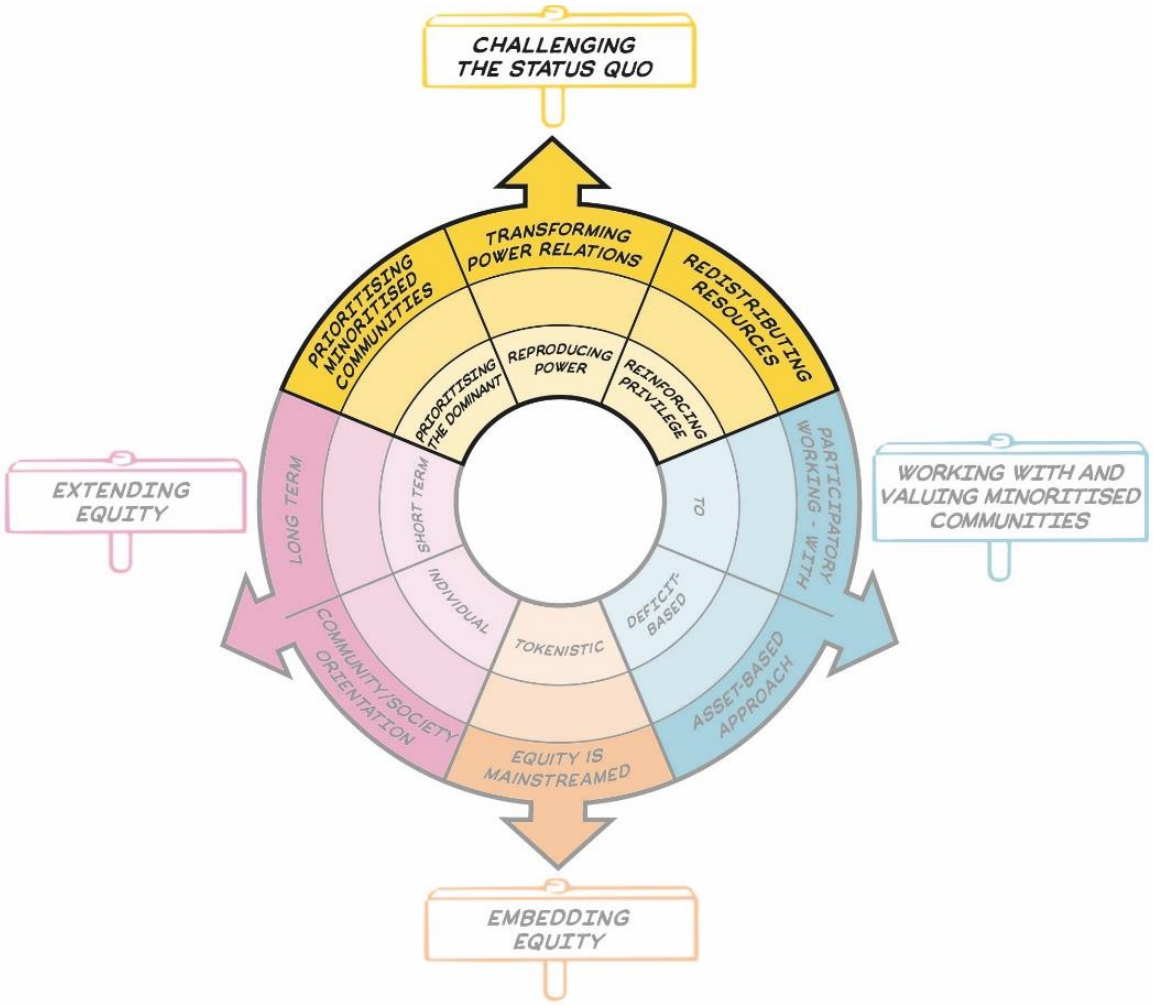
- Recognise and think about key dimensions of equity/social justice
- Use reflective questions to guide our thinking
- Consider how equitable practices are
- Map where we are – and map our progress (moving from inside outwards)



Twitter: @YESTEM_UK
#EquityCompass

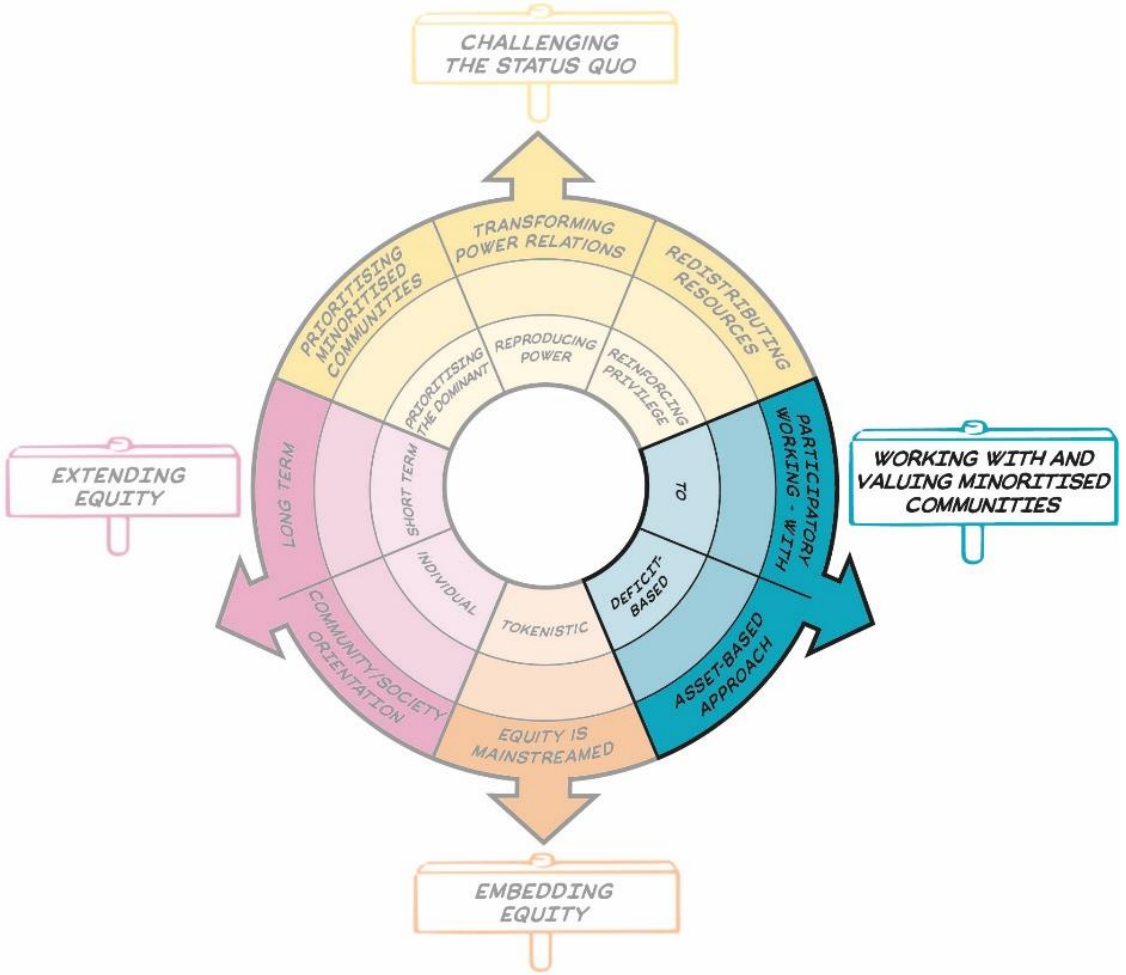
Challenging the status quo

Equity Dimension	Example questions
Transforming power relations	How do you challenge dominant ideas and representations in your session, e.g., scientists as clever, engineers as white men?
Prioritising minorities communities	Whose interests, values and needs drive what you do?
Redistributing resources	How is your practice supporting young people who tend to have fewer opportunities?



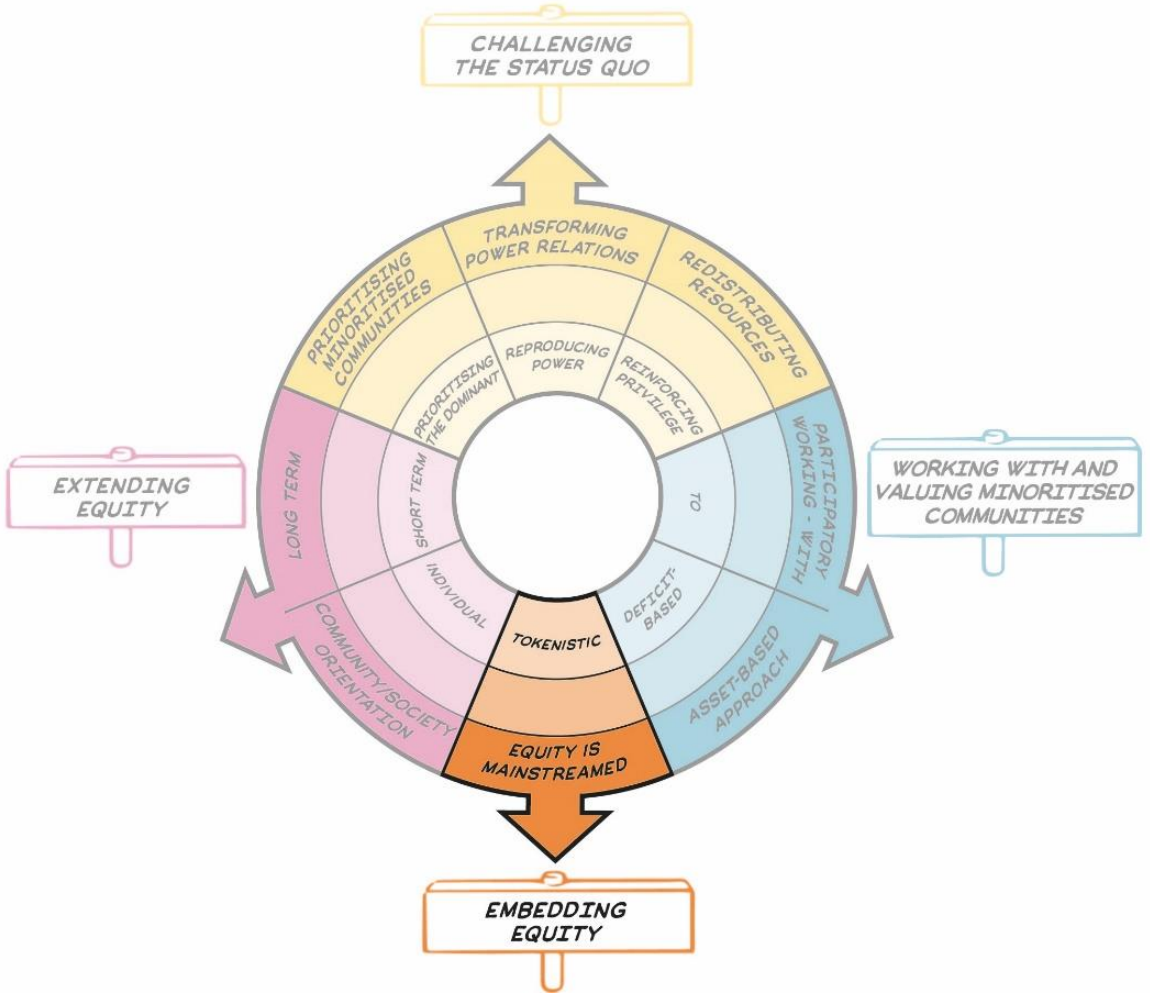
Working with and valuing minoritised communities

Equity Dimension	Example questions
Participatory working – with	How are young people involved in co-designing the sessions?
Assets-based approach	How are you valuing and recognising young people's broad range of knowledge, skills and experience in your sessions?



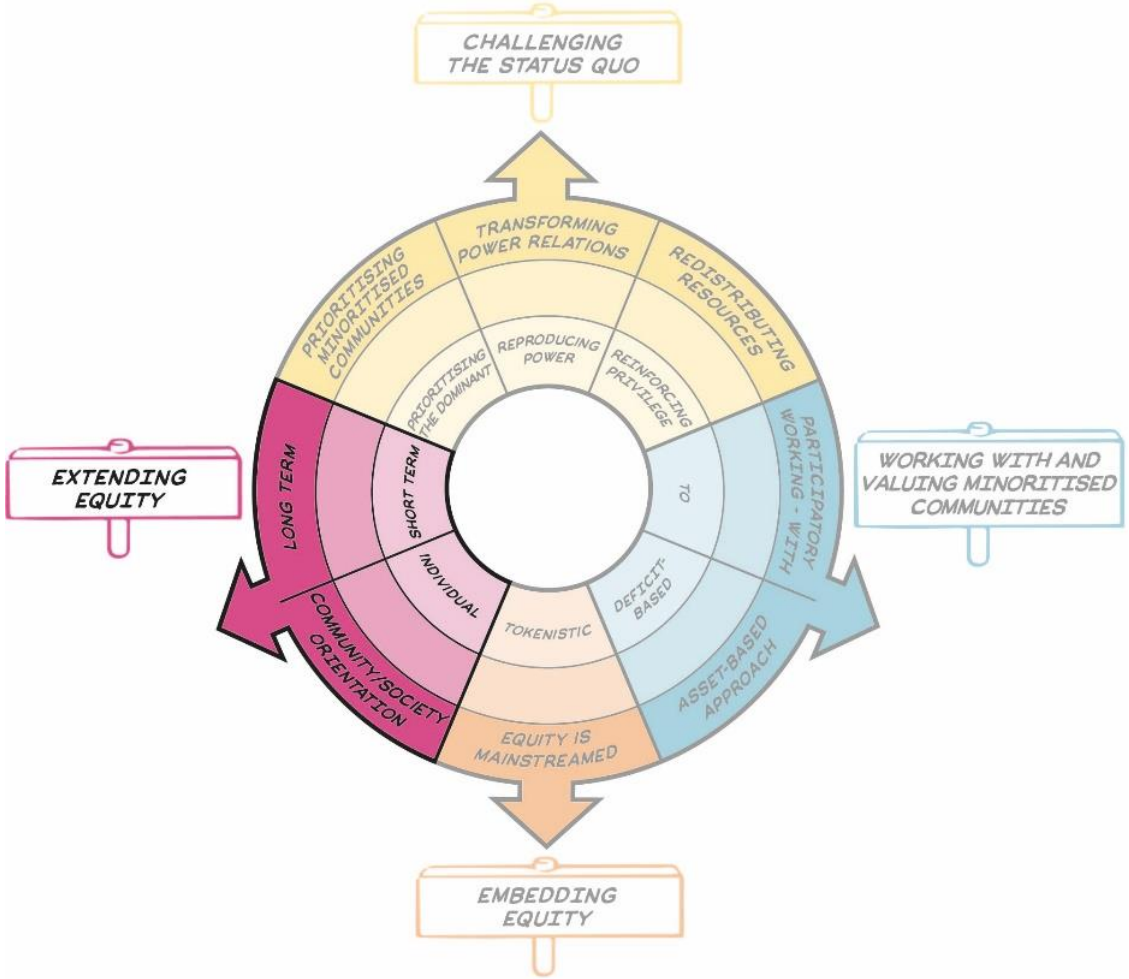
Embedding equity

Equity Dimension	Example questions
Equity is mainstreamed	How central, major, intentional and foregrounded are equity issues in your sessions?



Extending equity

Equity Dimension	Example questions
Long term	How might you be able to support longer-term engagement – either through the sessions directly, or by linking with other opportunities?
Community/ society orientation	How do your sessions support wider outcomes, e.g., for young people's families and community?



The Equity Compass: application to practice

- Professional development material for informal STEM learning sector
- Adapted for teachers and school leaders
- Used also by funders, policy in the UK and internationally
- Used by STEM Ambassadors

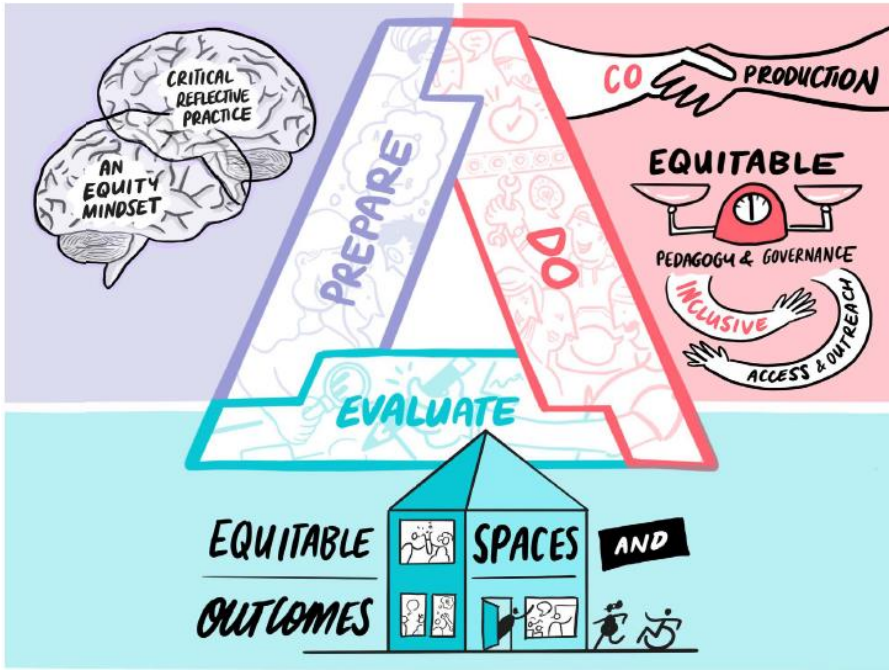
Key resources

- Online free course
- 2-minute Equity Compass animation
- Editable Equity Compass worksheet
- Equity compass full collection of tools

https://www.futurelearn.com/courses/equity-informal-stem-learning-using-the-equity-compass

Coming soon…Making Spaces

- Free online course for practitioner thinking about justice, equity in STEM
- Guidebook with practical examples
- Online Launch Event – 25th July



TWITTER:
@M4kingSpaces

Contact our projects	Twitter	Website
ASPIRES	@ASPIREScience	https://www.ucl.ac.uk/ioe/departments-and-centres/departments/education-practice-and-society/aspires-research
YESTEM	@yestem_UK	www.ucl.ac.uk/ioe-yestem
Making Spaces	@M4kingSpaces	m4kingspaces.org
Primary Science Capital	@PrimarySciCap	https://www.ucl.ac.uk/ioe/departments-and-centres/departments/education-practice-and-society/science-capital-research/primary-science-capital-project


THANK YOU


Any questions?