

Science Capital: The latest evidence for engaging under-served young people

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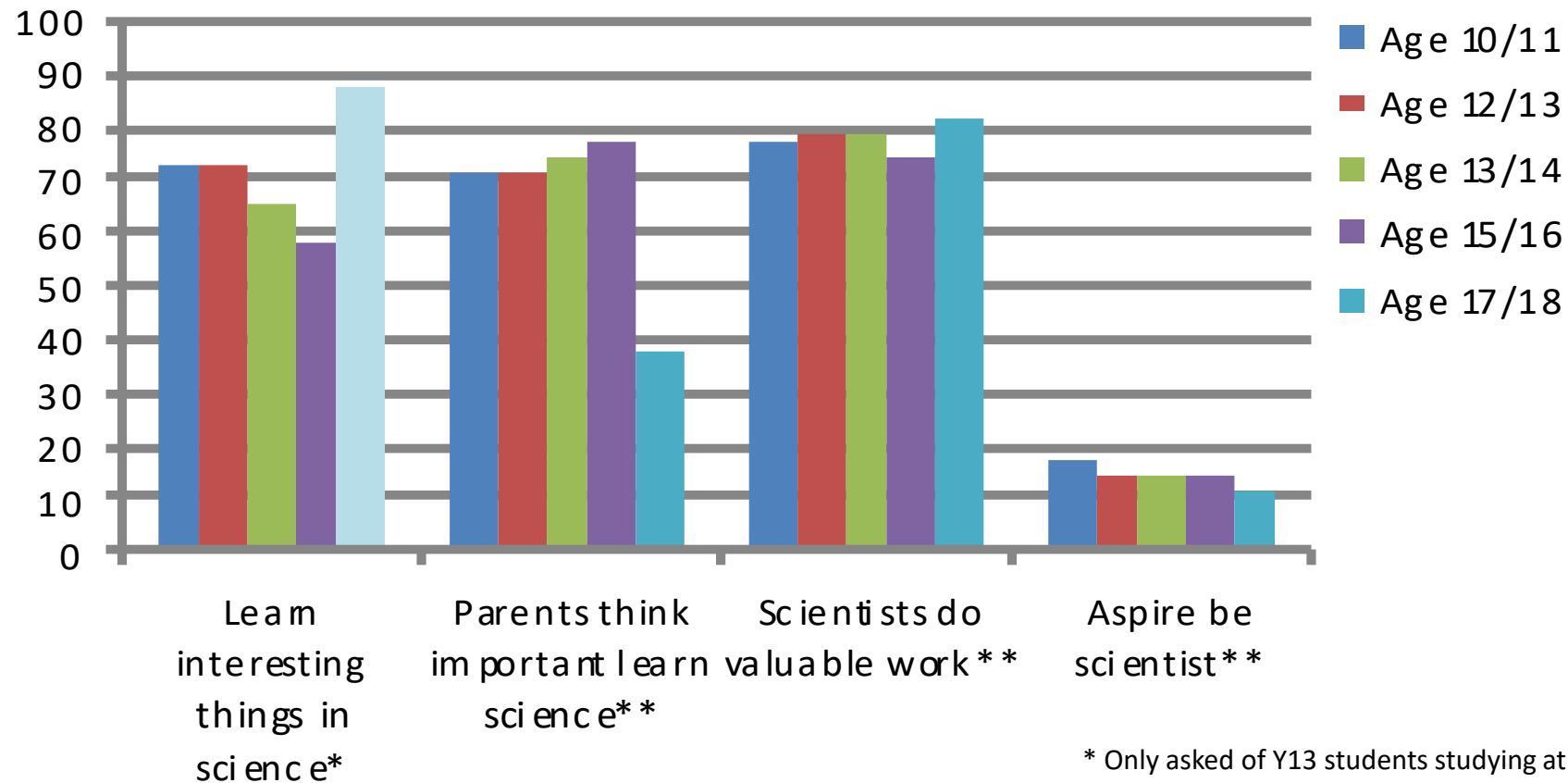
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Evidence from the Aspires studies

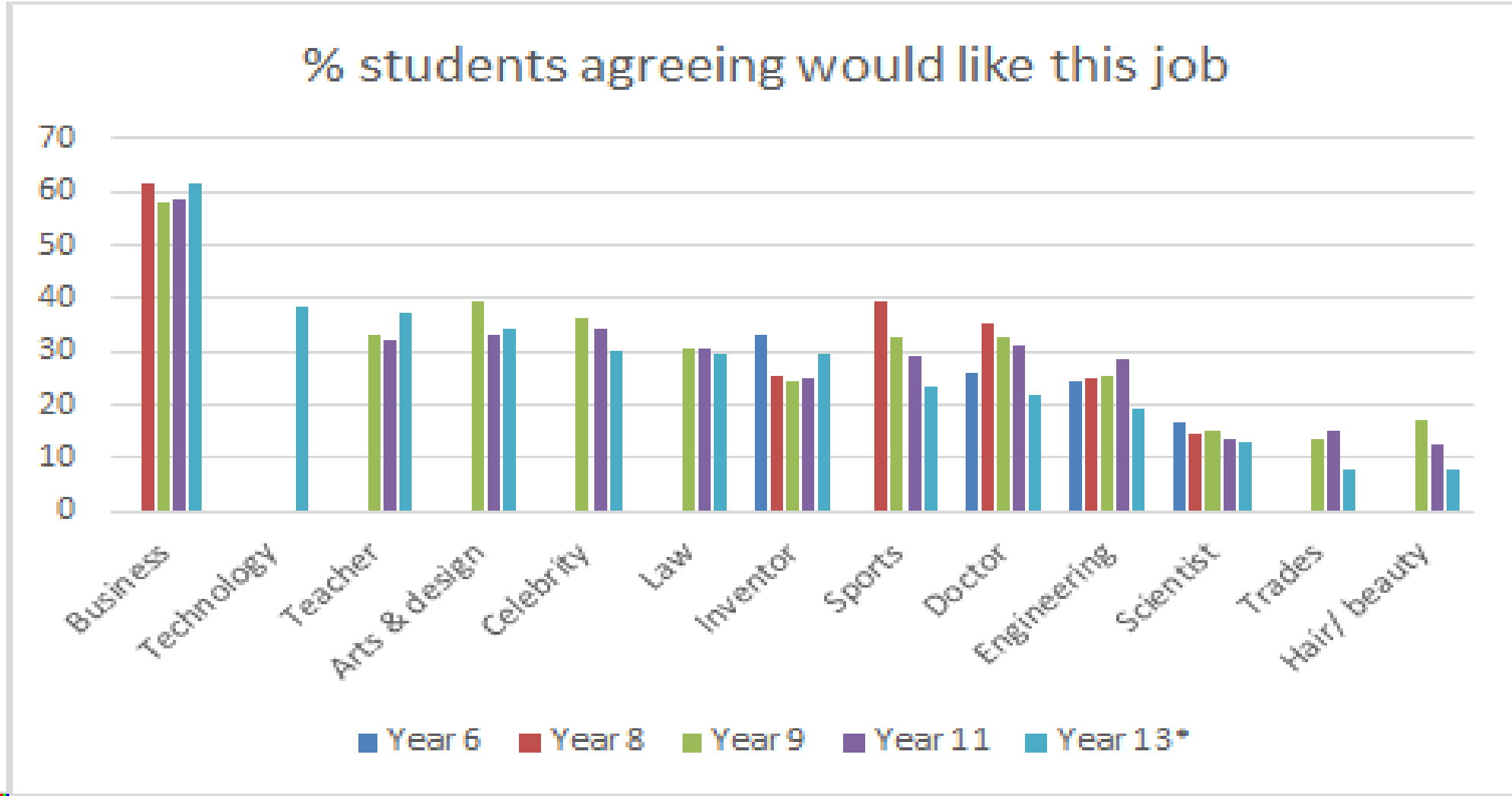
- ASPIRES / ASPIRES2 study: 10 year tracking of young people from age 10-18
 - Large scale surveys of cohort, over 40,000 young people to date (at age points: 10/11, 12/13, 13/14, 15/16, 17/18)
 - In-depth longitudinal interviews with 61 young people (from age 10-18) and their 65 parents

Science is interesting – but not for me

Comparison of survey responses from Y6, Y8, Y9, Y11, Y13 students
(% strongly/agreeing)



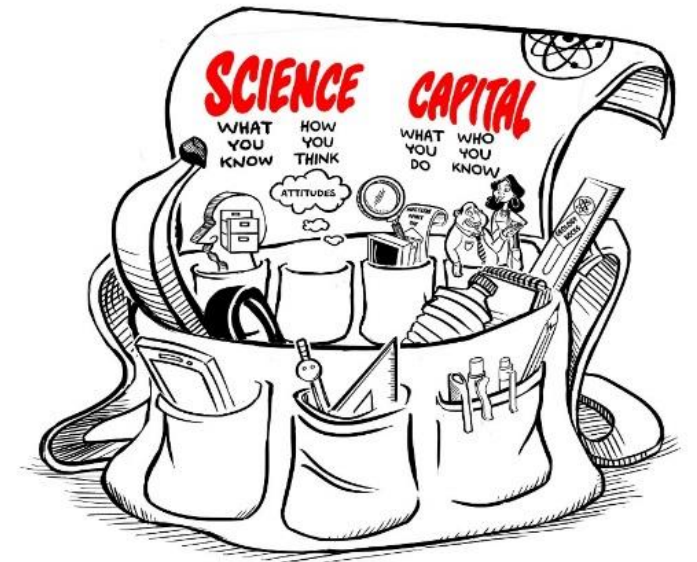
Aspirations age 10 -18



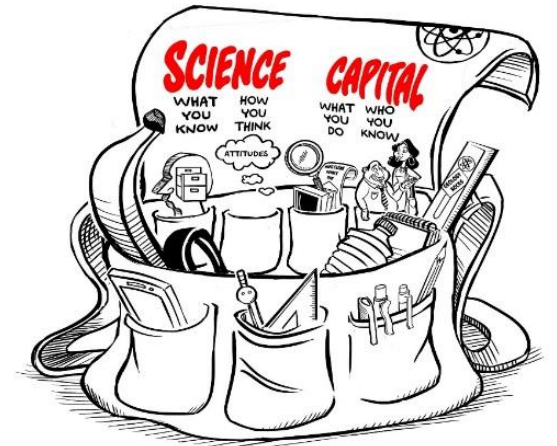
* Y13 data is weighted to national A level science entries

Science capital

- Developed in Aspires project and extended in Enterprising Science project
- ‘Science capital’ is a ‘conceptual holdall’, combining habitus, cultural and social forms of capital
- More precise (for understanding STEM participation) than cultural capital
- Nationally, about 5% of 11-15 year olds have high science capital and 27% low science capital



1. Science literacy (“what you know”)
2. Science-related attitudes and values (“how you think”)
3. Out of school science behaviours (“What you do”)
4. Science at home (“who you know”)



Science capital, STEM capital and engagement

- The more science capital a student has, the more (significantly) likely they are to aspire to post-16 science and have a 'science identity'
- *Emergent analyses:* exploring relationship between science capital and aspirations/attitudes to engineering, technology and mathematics

A sociological lens



Interactions of *habitus*, *capital* and *field* produce patterns in STEM engagement and participation:

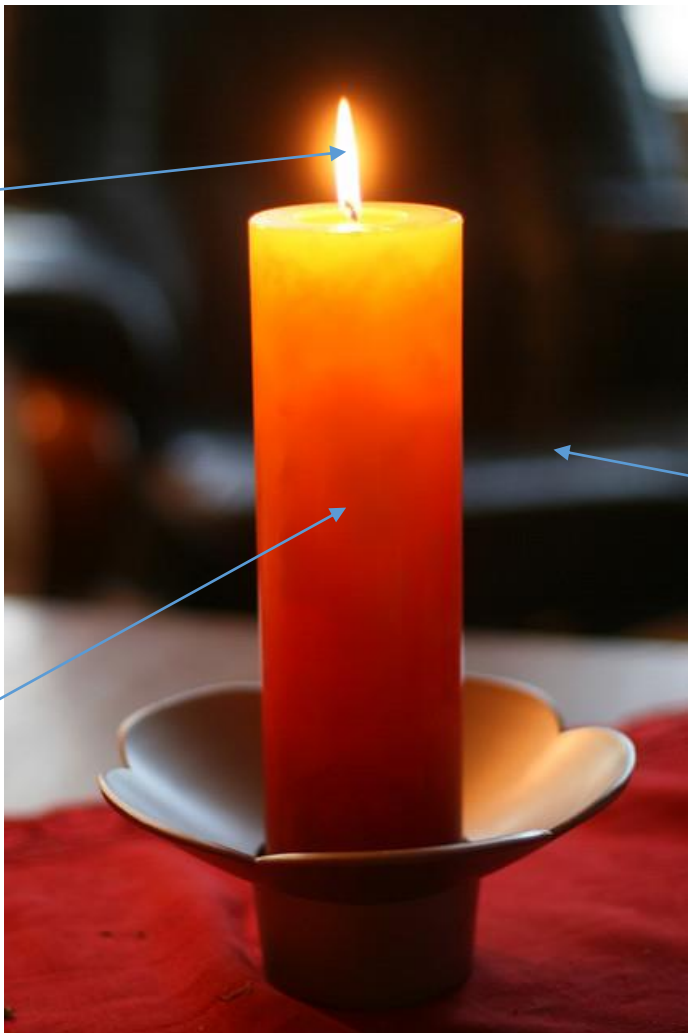
- ***Habitus*** - socialised, embodied dispositions shape whether science is ‘for me’, or not, formed through classed, gendered, racialized experiences: Gives a ‘feel for the game’
- ***Capital*** – cultural, social economic and symbolic resources possessed and accrued, shaped by social axes: the ‘hand’ you can play in the game
- ***Field*** – socio-spatial ‘space of positions and position-taking’: the ‘rules’ of the game

Extent of ‘fit’ between habitus, capital and field shapes whether students experience science/ STEM as a ‘fish in water’, (Science families – where science is ‘for me’), or not and produces differential trajectories

An analogy

ENGAGEMENT = burning flame
(produced at interface of habitus, capital and field)

HABITUS & CAPITAL = candle ('fuel'): socialised dispositions, and (science-related) economic, social and cultural resources



Educator = heat

FIELD = air and conditions around the candle (oxygen, wind, etc)
Influences if and how the candle burns (e.g. how bright, how long, flickering or steady)

Evidence from Youth Equity+STEM (YESTEM)

- 4 year UK/US study of what makes for equitable ISL pathways for young people from under-represented communities
- Angela Calabrese Barton (US PI), Louise Archer (UK PI), Emily Dawson (UK CI) and Lynn Dierking (US CI)
 - Youth ethnographies with young people not in ISL and who participate in eight ISL settings (designed/community) in London, Bristol, Lansing (Michigan) & Portland (Oregon)
 - Survey of representative sample of youth from each city (n= 1,873 in London/Bristol)
 - Practitioner portfolio work

SC and young people's engagement with ISL

- YESTEM survey of representative samples of 1,873 11-14 year olds, London and Bristol
- Emergent top-line findings: c.28% of young people say they do not engage in any sort of science and/or technology activities out of school
- Are we sufficiently conveying the benefits of ISL activities?
 - Of those who do some technology out of school, over half do **not** think it gives them valuable skills or future options and 73.4% do not see it as an important part of their identity
 - Of those who do some science outside school, 46.9% do **not** think it gives them valuable skills or future options and 77.3% do not see it as an important part of their identity
- No gender differences, but differences by ethnicity, cultural capital and science capital. More socially advantaged students were significantly more likely to report skills and identity outcomes
- I.e. the more capital and the more aligned your habitus with the ISL field, the more likely you are to derive benefits?

Science capital – a more powerful lens for understanding STEM participation?

- Previously shown with secondary school student data that science capital provides a stronger, more precise lens for predicting science identity and formal education post-16 plans than cultural capital (DeWitt et al.)
- YESTEM data – emergent analyses suggest science capital is a better predictor of local ISL participation than measures of cultural capital
- SC provides additional level of discernment that may be helpful for understanding ISL participation? (e.g. some young people with very high cultural capital have low science capital)

Who does not participate?

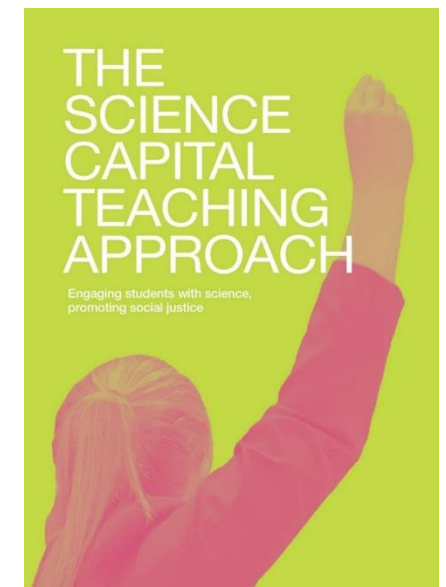
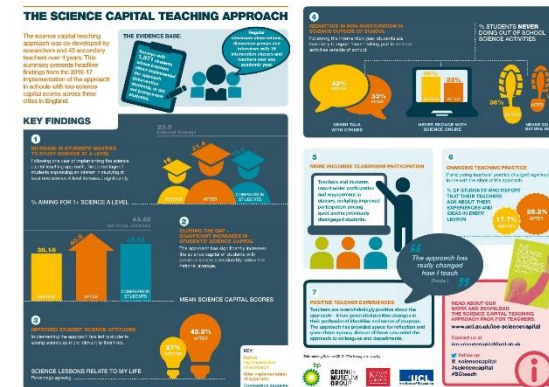
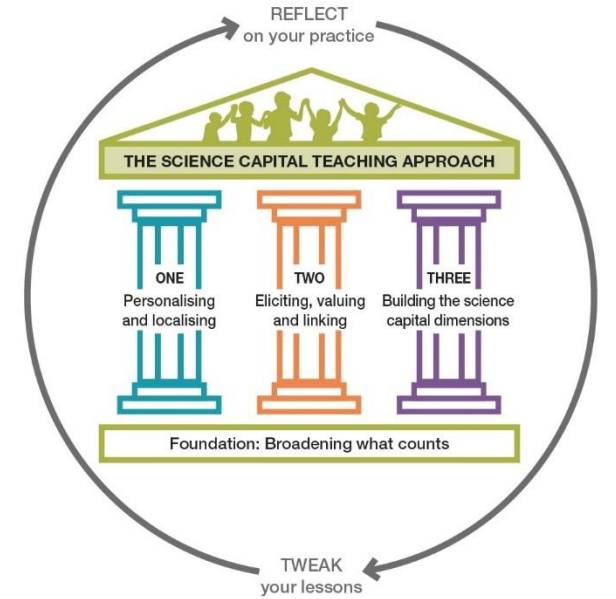
- Young people who self-identify as Black and those classified with low cultural capital and/or low science capital are significantly more likely to 'never' participate in local ISL settings

Applying a science capital lens

- Different patterns of reasons across different settings suggests impact of differences in field – e.g. there is still a challenge for science centres to widen perception that ‘not for people like me’ – especially among working-class and Black communities
- Students with more capital perceive and derive more benefits – so building SC could be beneficial

How to build science capital?

- Insights from Enterprising Science project – can apply principles from the Science Capital Teaching Approach. Evidence shows significantly:
 - Increases science capital
 - Increases science A level aspirations
 - Improves views of science (as personally meaningful and relevant)
 - Increases out of school science participation
 - Improves attainment & understanding



Engaging diverse youth with ISL and STEM

- Ongoing case study work with YESTEM partner settings suggests the power and potential of the ISL field for re-working young people from under-served/under-represented communities' relationships with STEM
- Currently – mapping youth outcomes across four different ISL settings
- Developing analytic frame to identify youth outcomes across 6 key areas:
 - Interest/fun;
 - STEM learning;
 - STEM capital;
 - STEM identity;
 - STEM trajectories;
 - Agency+

Emergent findings

- The difficulty of identifying outcomes!
- Variable outcomes within and between settings – although some emergent patterns
- Most consequential changes were among working-class young people esp. those who dislike school science
- Longer-term, assets-based programmes record wider, stronger, more consistent outcomes
- Equitable, inclusive pedagogies seem to benefit all young people
- Aligning approaches, pedagogy and content with under-served young people's habitus and capital can produce substantive, consequential outcomes (even from comparatively short programmes) – “why can't school science be like this?” (Lulabelle)

Conclusions and Implications

- Science participation is socially patterned and formed through complex interactions of multiple factors
- Can be understood as shaped by interactions of science capital, habitus and ‘field’
- To improve young people’s relationships with STEM, inspiration and interest is not enough – we need to build science capital
- Key part of this is building identity and personal relationship with STEM
- Building science capital does seem possible - changing the field is more powerful and practical than focusing on trying to change young people individually
- Need more space and support for educators to engage with complex & nuanced understandings of inequality plus professional reflection and taking ‘risks’
- No simple or one-off intervention will change STEM participation – call for support for longer term initiatives and mainstreamed approaches

Messages for decision-makers

- Can further support young people's encounters with science (in and beyond the classroom) using science capital educational approach principles
- Focus more on changing institutional settings and systems – rather than young people
- Take the long view: Move from one-off to more sustained approaches
- Use science capital survey tools appropriately
- Improve connectivity within and between settings: pathways, progression and partnerships



Additional thoughts for ISL

- Value of equitable, inclusive pedagogies for all youth and esp. those from under-served communities
- Active targeting (of the 'nevers') can be effective especially when schools often do not select e.g. low sets for visits ("we never get picked")
- Scope for more focus on identity-building
- Scope for more cross/inter-institutional support for pathways (What next?) and capital translation across settings
- Focus on small nudges not just big 'end goals' (e.g. STEM careers)
- Differentiation of provision - for different communities and trajectory points (e.g. inspiration versus resilience - 'satisfying an existing taste' vs. cultivating new tastes/appetites)
- Be a resource, not a destination ...

Thank you! Contact us:

Website: <http://www.ucl.ac.uk/ioe/departments-centres/departments/education-practice-and-society/aspires>
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