Enterprising Science

Inspiring science learning with teachers, students and families

‘Science is not for me’: understanding young people’s non-participation in STEM

Professor Louise Archer,

King’s College London

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Evidence base

- **ASPIRES** study (children's science and career aspirations age 10-14)
  - 5 year ESRC funded longitudinal study, 3 tracking phases: *Y6 (age 10/11),* Y8 (age 12/13) and Y9 (age 13/14)
  - Over 19,000 surveys and longitudinal interviews with 83 students and 65 parents
- **Enterprising Science** project: helping students to find science engaging and useful
  - 5 year project: KCL, Science Museum, funded by BP
  - Interventions with schools, young people and families
  - Over 9,000 surveys to date and in-depth qualitative research (observations, interviews, focus groups)

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ASPIRES

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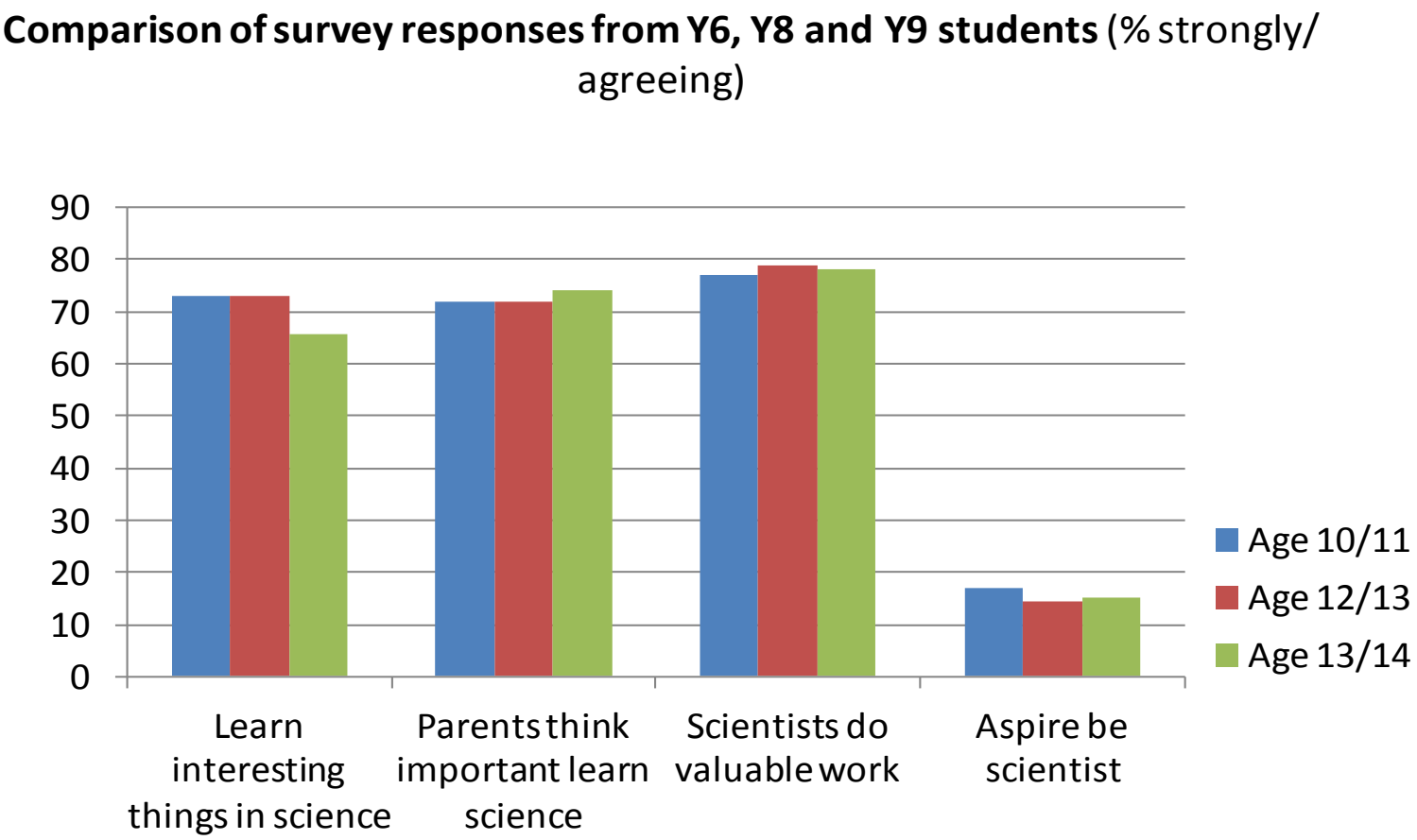
Most students see science as interesting - but not for me!



ASPIRES

‘Science capital’

- Science-related qualifications, knowledge, interest, literacy and contacts
- ASPIRES research shows that young people from families with high science capital are more likely to aspire to STEM careers and/or to study science post-16
- Effects of science capital seem to increase over time

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High science capital families

- Science highly visible and familiar in family life
- Lots of opportunities, resources and support for children to develop mastery, ‘feel’ for and valuing of science
- Science is part of ‘who we are’

  “The other day in the car we were laughing about chemical symbols and things, so I guess it does come into the discussion quite subliminally really” (Mother).

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Low science capital families

- Science as ‘interesting - but not for me’
- Over-representation of working-class (White and Black) families
- Science defined more through its absence than presence
  - “I suppose in everyday life you don’t get that much to do with it [science]” (Parent)
  - “I’ve never asked them about science” (Lucy)
  - “They never talk about science” (Jack)

ASPIRES

Science as only for the ‘brainy’

- Over 80% of Y6-Y9 students see scientists as ‘brainy’
- Post-16 science and science careers seen as only for the exceptional few
- Those who see science as “interesting, but...” tend to be ‘middling’ pupils

> “She [daughter] said ‘oh, you have to be really clever [to study science]’ .. She says ‘I’m not clever enough to be good at science’” (Sandra, mother).

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Particular issue for girls

- Very interested in science – but not post-16
- Views of science as male-dominated ("its not girly, its not sexy, not glamorous")
- More 'girly' girls are less likely to express science aspirations (perceived lack of fit with popular femininity) – tougher balancing act
- Some negative experiences of science spaces
- Only for 'clever' girls

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Ethnicity – Black students

- Compounding and amplification of factors due to multiple, intersecting inequalities
- Science identities more precarious

Enterprising Science project

Approach – Build science capital through emphasising relevance and increased science discourse between secondary school teachers, young people, their families and museums and science centres

Working with disadvantaged students in London, York, Bradford and Manchester

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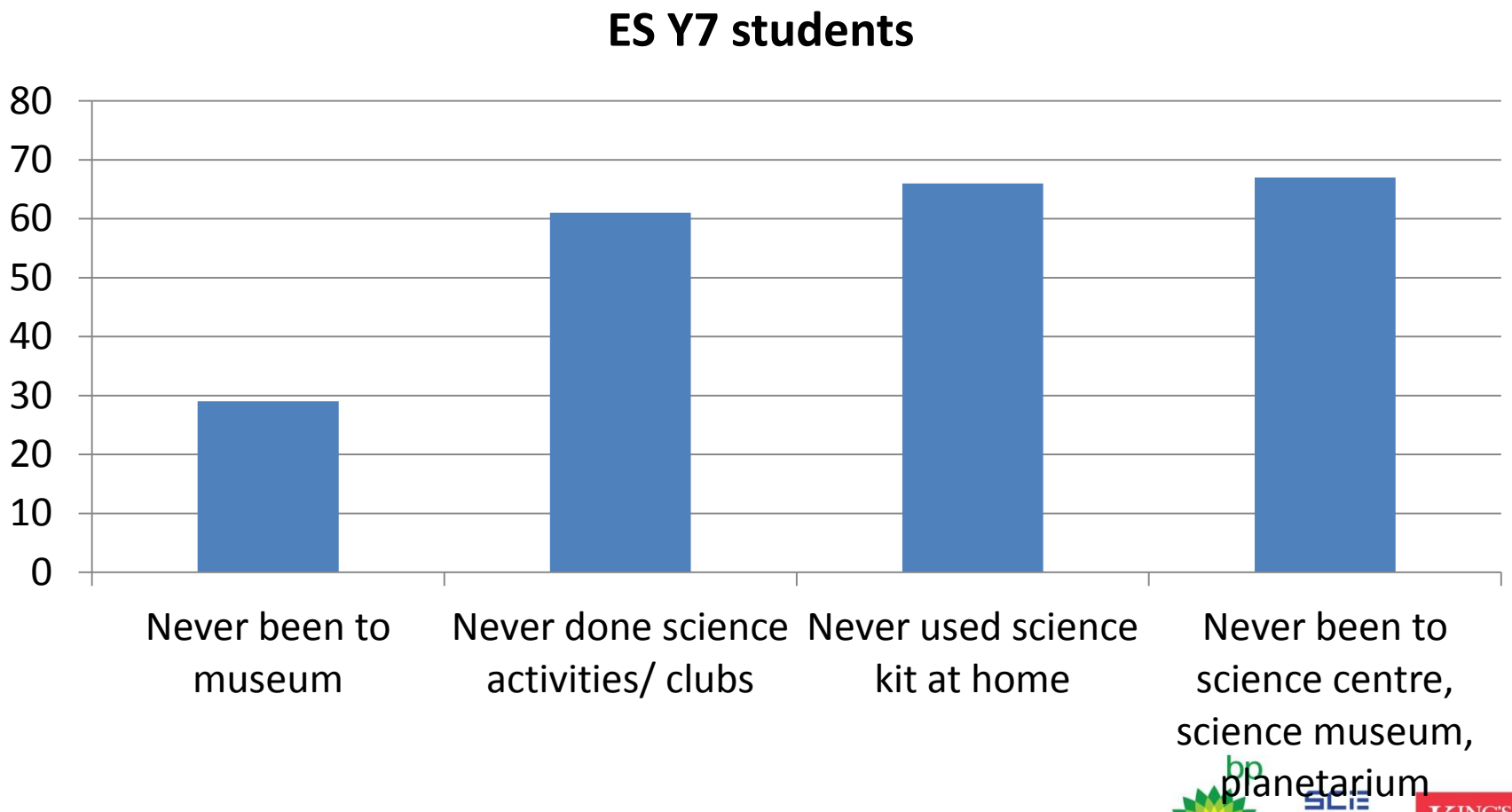
Participating students – baseline survey 2013 (out of school science)



Developing an index of science capital

- Development of science capital survey to ‘measure’ science capital
- Combination of science-related cultural capital and social capital
- Tested with nationally representative sample of 3658 students aged 11-15 from 45 schools in England in Spring/Summer 2014.

Of the national sample students surveyed:

- High science capital: 5%
- Medium science capital: 68%
- Low science capital: 27%

Patterns in science capital

- **Gender**: boys scored significantly higher than girls ($p < .01$)
- **Ethnicity**: Middle-Eastern, South/East Asian score higher than White and Black
- **Cultural capital**: high cc relates to high sc
- **School set**: high sets relate to high sc
- **Future science affinity and post-16 plans**: significant relationship to post-16 plans

Relationship between science capital and science aspirations

E.g. % of students agreeing ‘I would like to study a science subject at University’:

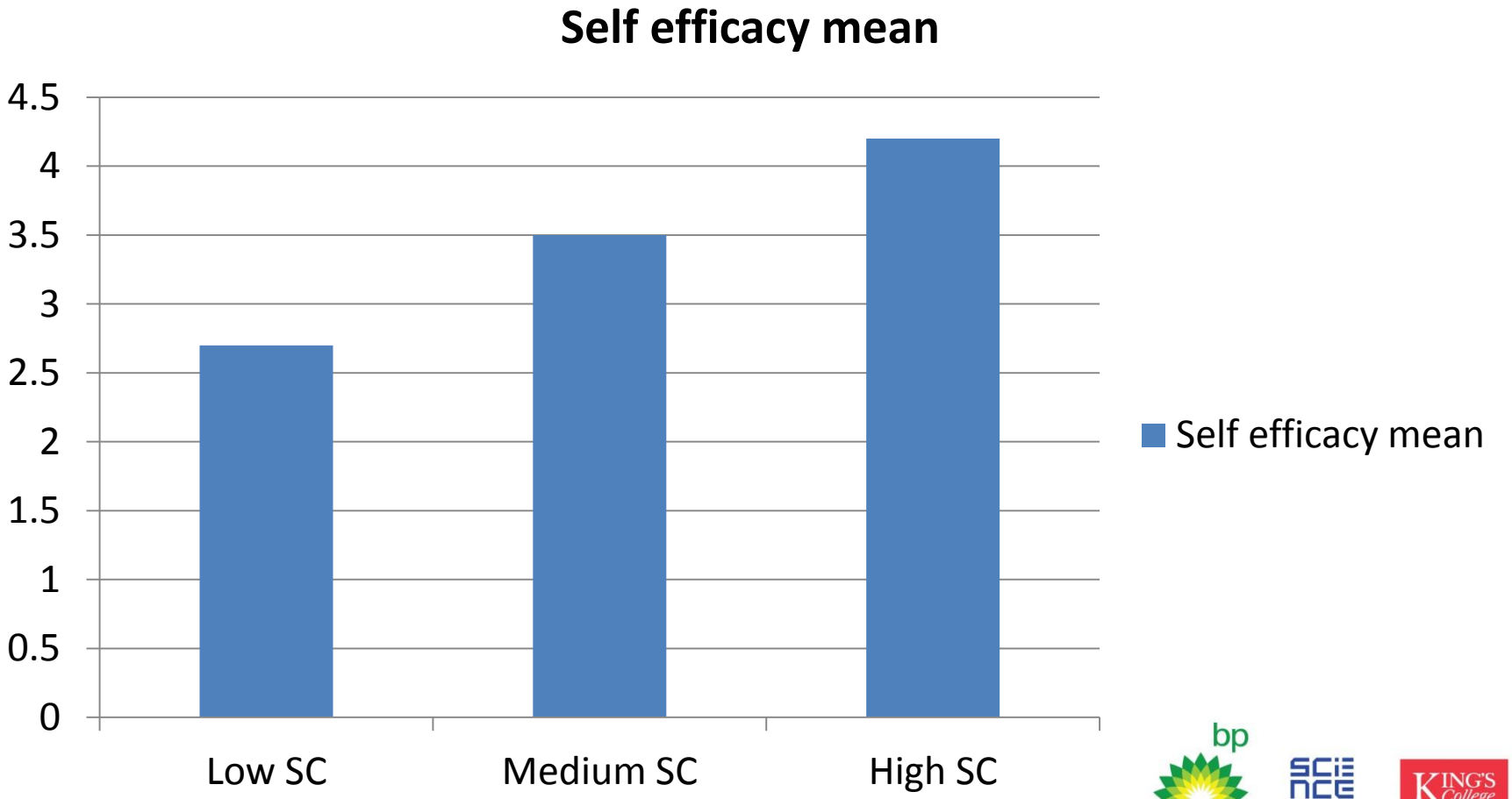
High science capital:	50%
Medium science capital:	22%
Low science capital:	6%

Science capital and science identity

"Other people think of me as a science person"

- Low science capital: 3%
- Medium science capital: 23%
- High science capital: 80%.

Significant relationship between science capital and self-efficacy



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So what can we do?

- ES project is drawing on museum pedagogy to help build science capital, bringing together schools, families, young people and ISLEs

Design

	Year 1	Year 2	Year 3	Year 4
Making the most of OS visits	Design and pilot, SFP (2 London schools)	Roll out, SFP (London, York, Bradford, Manchester)		
Promoting careers *from* STEM	Develop with teachers (TP3)	Pilot , SFP (2 London schools)	Roll out, SFP (London, York, Bradford, Manchester)	
Working with families	Pre-pilot, SFP (5 London families, 1 school)	Develop with teachers (TP3)	Pilot, SFP (2 London schools)	Roll out, SFP (London, York, Bradford, Manchester)
CPD			Develop/ pilot	Roll out

Interventions are guided by 5 research informed reflection points

1. **Content**: What **science knowledge/concepts/skills** are participants learning?
2. **Relevance**: How does the intervention encourage participants understand the **usefulness and relevance** of science to their everyday lives? (e.g. How are you helping participants to make links between science and their personal lives, interests and cultural backgrounds? Are you using 'real life' problems?)
3. **Different**: How does the approach going **beyond 'usual' practice** to develop learning inside and outside the classroom? (e.g. How are you enabling wider forms of student engagement and expression?)
4. **Literacy:** How are **enquiry and discussion** being used to develop participants' scientific literacy?
5. **Challenge stereotypes**: How does the approach **challenge traditional stereotypes** about science/scientists (as 'brainy', white, male, middle-class) and build participants' confidence in seeing *themselves* as 'scientists'?

Initial findings

- Capital builds capital: Families/ young people with higher levels of science capital can leverage more value and science learning from museums
- Co-constitutive relationship of museum field and students' identities on visits (esp. gender/ masculinity)
- Importance of building 'child as expert'

Emergent lessons for building science capital with 'hard to reach' families

Relevance

- Linking OSL with curriculum (ensuring relevance for schools)
- Linking with/ youth/ family culture and identities

Resources

- Recognising access / participation issues (cultural, economic, geographic)

Relationships

- Building long-term relationships with schools and families/ communities

Resilience

- Building/ strengthening student science identities

Look out for more to come!

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