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Post-16 participation in physics: a survey to explore the factors that influence it

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Aims and Objectives



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To identify range of factors (individual, school and out-of-school, including home) that influence post-16 participation in mathematics & physics

To assess the relative importance of such factors among different student populations

Structure of Project



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Strand 1: Mapping trajectories of engagement and disenchantment

A longitudinal design: survey on 20,000 students (12-13 & 14-15 yr olds) in 140 UK schools & followed up 18 months later

Strand 2: Investigating subjectivities and school culture

Interview and ethnography-based study, 9 students in each of 12 schools, 3 times in 3 years

Strand 3: Documenting the reasons for HE choices

Narrative interviews with 50 first-year University students

Strand 1 Sample



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Total sample of approximately 20,000 students in two year groups (aged 12-13 & 14-15) in England, Wales, Scotland and Ireland

For this presentation, one core dataset from England

- survey responses (student & school) of year 10 students (aged 14-15)

Current multi-level models

- 1881 students in 63 schools (physics)

Strand 1 Instruments



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1. Physics Student Questionnaire for 14-15 year olds

Student Physics Questionnaire Constructs	Reliability	N of items
Self concept	.821	12
Advice pressure to study	.853	5
Intrinsic value	.801	7
Extrinsic value	.863	9
Attitude to and perceptions of math/physics lessons	.592	5
Perception of teachers	.858	14
Sense of school belonging	.828	6
Emotional stability	.700	6
Competitiveness	.707	9
Introversion	.604	4
Home support for achievement	.621	8
Home support for achievement in general	.852	3
Relationship with parents	.743	4
Engagement with ICT	.575	6
Social support	.637	6
Global Motivation & aspiration	.733	4

Strand 1 Instruments



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2. Physics School Questionnaire

School Physics Questionnaire Core Themes	N of items
Extent of informal & formal internal collaboration	3
Number of students taking post 16 maths & physics courses	2
Awareness of the issues of post-16 engagement	6
Engaged in enrichment activities to promote post-16 engagement	4
Schools with policies that promote continuation	12
Schools that value mathematics & physics teachers (CPD)	13
Schools that ensure good careers advice are in place	3
Schools with adequate and stable mathematics & physics staff	7
Priorities of maths & physics department	5
How schools deploy maths & physics staff	10
Explore whether schools have adequate mathematics & physics resource	8
Qualitative approach of schools with adequate mathematics & physics resources	2
Background information on the teacher who filled in the questionnaire	9

Current dataset



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Student questionnaire data is matched to the

- National Student Database (NPD)
- Student Level Annual School Census (PLASC)
- responses to school questionnaire

NPD & PLASC datasets hold information on

- students' attainment records at age 7, 11 and 14
- background details on students such as gender, eligibility for free school meals, ethnicity, IDACI

School Characteristics



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Segmentation by attainment & post-16 participation rate of school	(%)
High attainment, high staying-on	44.9
High attainment, average staying-on	15.8
High attainment, low staying-on	5.8
Low attainment, high staying-on	5.9
Low attainment, average staying-on	13.0
Low attainment, low staying-on	14.6
Segmentation by mathematics & physics post-16 participation rate of school	(%)
High maths, low physics	4.1
Low maths, high physics	2.1
Low maths, low physics	19.8
Average maths, average physics	22.4
High maths, high physics	51.7

Admission policy of the school	(%)
Comprehensive	82.0
Selective	14.8
Modern	3.2
Gender intake of school	(%)
Boys	9.8
Girls	21.0
Mixed	69.2

Intention to Participate in Post-16 Physics



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- **More students reported that they *were not* intending to study physics post-16**
- **Intention to participate is just over 3 times as likely amongst boys than girls.**

Physics conceptual scores: Gender differences



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- **More girls than boys score high in physics conceptual questions**
 - **10.2% of girls versus 7.6% of boys**
- **Though girls were less confident**
 - **15% of girls versus 32% of boys had no confidence in their answers**

Multi-level analysis



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Overall findings

School level predictors

- Specialist teachers in classes at ages 11-14 not ages 14-16
- Academic selection

Student level predictors

- Boys were on average more likely to express an intention to participate in physics post 16, though gender lost significance after controlling for some key school level influences.
- Black heritage less likely to participate
- Extrinsic motivation
- Self concept
- Confidence in conceptual tasks

Multi-level analysis



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Example of items

Constructs	Student items	School/teacher item
Self concept	<i>I look forward to physics lessons</i> <i>I am good at physics</i>	
Confidence in conceptual tasks	<i>How confident are you that your answer to the question above is correct?</i>	
Extrinsic motivation	<i>People who are good at physics get well-paid jobs</i>	
Specialist teacher in class		<i>What proportion of KS3 physics classes are taught by specialist physics teachers?</i>

Multi-level analysis: Comparative analysis using attainment



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Differences between the two models

- **Students socio-economic status (FSM & IDACI)**
- **Black heritage less likely to state an intention to participate**
Attainment: Asian, Black, Indian and Other heritages were less likely to do well
- **“Competitiveness” is good predictor of attainment not participation**
- **Score in conceptual tasks related to attainment not participation**

Similarities between the two models

- **Confidence in conceptual tasks (both attainment & participation)**
- **Self concept (both attainment & participation)**

Multi-level analysis: arising questions and further steps



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Tease out in full sample, strand 2 and follow up survey

- **differing relationships in explaining intention to participate and attainment & their inter-relationship**
- **the importance of specialist physics teachers at ages 14-16**
- **other significant student and school characteristics**
- **differential school effects**

Combine with strand 3 results about Higher Education choices

Thank you

For further information on UPMAP

[http://www.ioe.ac.uk/study/departments/
gems/4814.html](http://www.ioe.ac.uk/study/departments/gems/4814.html)

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