



Isaac Physics & STEM SMART: Impact of sustained engagement on student outcomes

Prof. Lisa Jardine-Wright
Director



This symposium is
generously funded
by



**making
physics
matter**

Liz



Isaac & STEM SMART Team



Physics

David



Nicki



Robin



Lewis

Biology



Ingrid



Andrea

Chemistry

Maths



Julia

Lisa

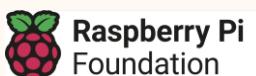
Anton

Kimlam

Matthew



Jonathan



Ada
Computer
Science



Diane

Alex

Harriet

Laura

Isaac Physics: What are we?



Isaac is an Open Platform for Active Learning (OPAL)

- A **free interactive resource** to supplement and complement school teaching
- **Not an exam board** or indeed associated with any exam board. We provide core resources for all exam boards mapped to UK specifications.
- **For teachers** to pick and choose what they would like to use
- **Not** a curriculum, scheme of work or teaching order (more on that later)
- **For students** to use for independent self-directed learning, revision and development.

Isaac: Our ideology



That we **learn by doing**

- Our research demonstrates that student develop a deeper understanding, fluency and confidence by solving many problems.

We **do not provide answers** to users

- Instant feedback is provided when an answer is entered into the site
- Our team is here to help - students and teachers can contact us at any time for help with a question (website or indeed WhatsApp community)
- We know there are answers out there on the market but
 - They are not checked, certified or sanctioned by us
 - the greatest educational benefit is through doing the problems.

Isaac: Aims



1. To reduce the workload of teachers so that they may focus on their students' specific needs and spent their time on their passion for their subject and teaching.
2. To increase the number of students studying physics at the next stage of their career
3. To raise attainment for under-represented groups at GCSE and A level (or equivalent)
4. To increase progression to physics and engineering at research intensive universities
5. To retain a focus on education and learning and not on ticking specific mark scheme boxes.

Isaac: Objectives

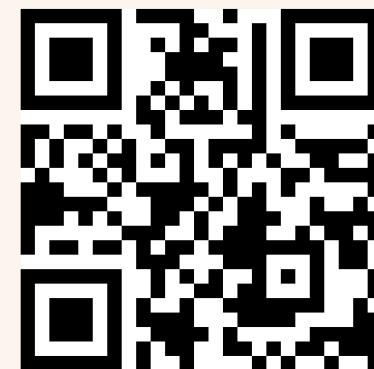


- Provide a **low stakes environment**
- Instant customised marking with customised feedback and hints to enable the user to self-scaffold.
- Automatically mark many style of questions and to remain research active in online learning.
- Tools for teachers to be able to set work as simply as possible and have marks returned to them automatically
- Subject specific support in physics and maths through online and in person events for teachers and students.

Isaac Physics: Summary



- **A FREE online resource** for teachers, and students (aged 11 – university)
- **Auto-marking at scale for teachers** –providing instant feedback and freeing up their time
- **Cutting edge platform development** – variety of questions types
- **Cost price books** – with interactive online feedback



tinyurl.com/25qtypes

11-14

Isaac books

A level / IB / Adv. Highers



GCSE

isaacscience.org/books

University

Isaac Physics Reach: Sep 23 - Aug 24



Our registered user statistics:



Average 230 questions/ student



422 in lowest 40% deprivation



Set ~67,000 assignments

Schools with students using Isaac Physics



Isaac Physics Teacher Impact: Sep 23 - Aug 24



For teachers:

- **Teachers** estimate that using Isaac Physics saves them more than **500,000 teacher hours** per academic year.

"I'm looking for ease of use – and I'm looking for impact on the students' learning."

Nick Davies

Head of Physics, Wilmslow High School

"We have biologists and chemists teaching Year 7 and 8 physics....who are now really enjoying teaching physics."

David Buckley

Physics teacher, Westcliff High School & Beauchamps High School

"Allowing students to answer questions online and immediately see how they are doing means they know whether they need to come in and ask for help – and that has had a big impact on their progress."

Sara Willis

Physics Subject Lead, Rugby Free School

STEM SMART: What we provide



- **Subject Mastery & Attainment Raising Iuition**
- **16-months** of free tuition (maths & sciences) in 3 phases from year 12 to end of year 13.
- **Weekly homework and online tutorials** in each subject for >2500.
- **Educationally disadvantaged and/or statistically less likely to progress to HE.**
- **Optional residential** in Cambridge for the ~400-450 most engaged students.
- **Optional small group supervisions** instead of larger group tutorials at start of year 13 for most engaged students.

STEM SMART Reach: Jan 2025 - 4th Cohort



2024

4945
real applications

3363
offers made

2876
accepted

2104
attended launch

2025

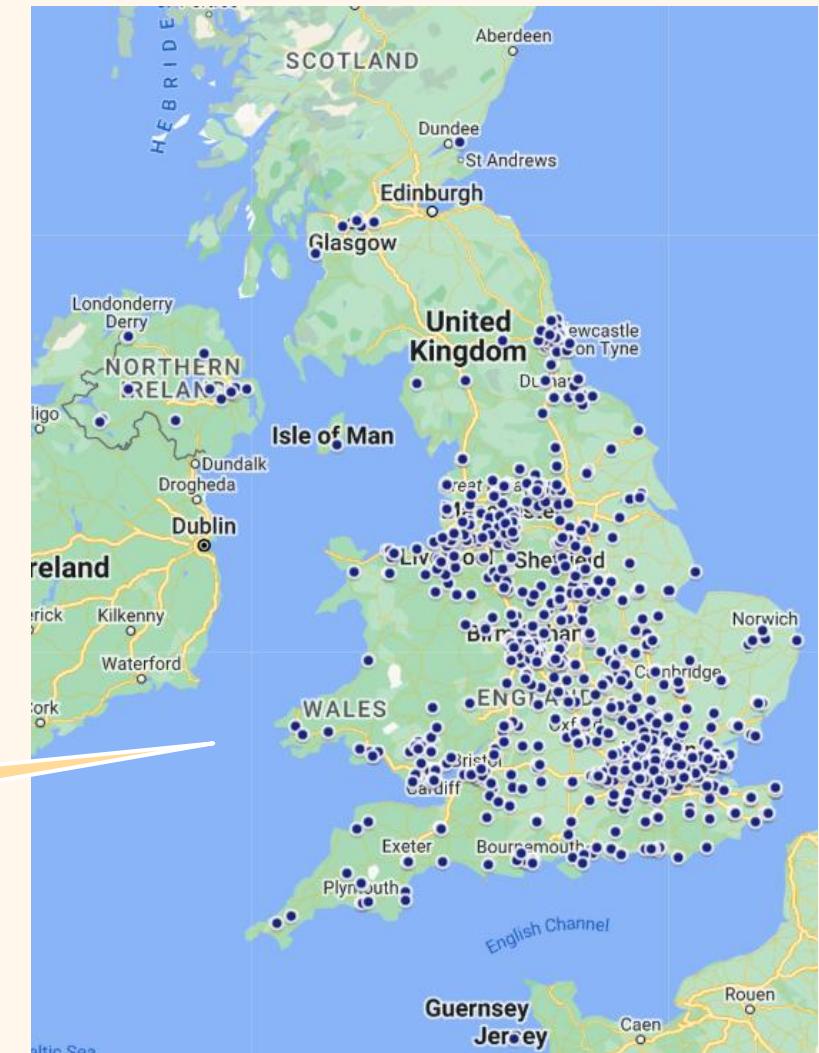
5984
real applications

4073
offers made

3131
accepted

2664
attended launch

Schools with students invited to participate (1267)



"I am loving STEM SMART so, so much, particularly as it is encouraging me get ahead of the content taught at school which is already helping me significantly!"



UCAS evaluation: The data



Data submitted



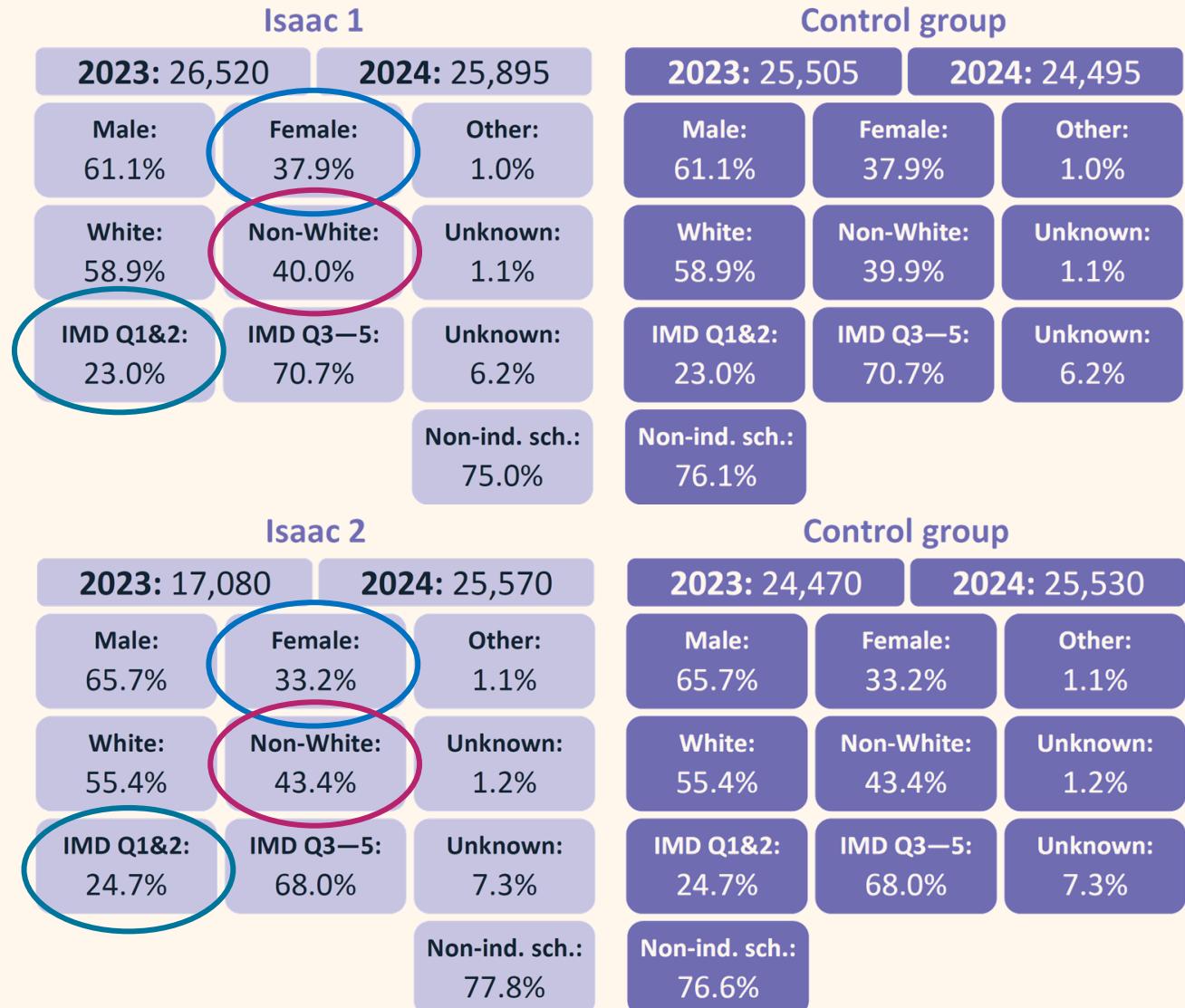
UCAS Category	Number of questions attempted	Isaac 1 matched		Isaac 2 matched	
		2023	2024	2023	2024
Low	$0 \leq N < 50$	6,855	7,370	3,805	6,725
Medium	$50 \leq N < 200$	9,005	10,115	5,130	8,255
High	$200 \leq N < 1000$	9,175	7,865	6,645	8,985
Very High	$1000 \leq N$	1,485	545	1,495	1,600
TOTAL		26,520	25,895	17,075	25,565

	STEM SMART 1		STEM SMART 2
UCAS category	2023	2024	2024
Very Low	195	15	175
Low	155	5	185
High	215	5	145
Total	565	25	530

Cohort matching: Isaac Physics



- Four separate control groups were created from the pool of all applicants who made an application to one of the several specified courses of interest (all STEM).
- Created using stratified sampling against key demographics.





Cohort matching: STEM SMART

- Additional constraints were applied for the control group for STEM SMART:
 - Must attend a state-maintained school
 - Must be taking A level maths (or equivalent)
 - Must be taking another A level from further maths, physics, chemistry, biology (SMART 2 only)

STEM SMART 1			Control group		
2023: 565		2024: 25	2023: 3,230		2024: 2,765
Male:	Female:	Other:	Male:	Female:	Other:
48.1%	51.7%	0.2%	48.1%	51.7%	0.2%
White:	Non-White:	Unknown:	White:	Non-White:	Unknown:
37.7%	61.8%	0.5%	37.7%	61.9%	0.4%
IMD Q1&2:	IMD Q3—5:	Unknown:	IMD Q1&2:	IMD Q3—5:	Unknown:
54.1%	44.8%	1.2%	54.1%	44.8%	1.1%
Non-ind. sch.: 98.3%			Non-ind. sch.: 100%		
STEM SMART 2			Control group		
2023: 0		2024: 530	2023: 0		2024: 3,000
Male:	Female:	Other:	Male:	Female:	Other:
44.0%	54.3%	1.7%	44.0%	54.3%	1.7%
White:	Non-White:	Unknown:	White:	Non-White:	Unknown:
27.2%	72.1%	0.8%	27.1%	72.1%	0.8%
IMD Q1&2:	IMD Q3—5:	Unknown:	IMD Q1&2:	IMD Q3—5:	Unknown:
57.2%	40.8%	2.1%	57.2%	40.8%	2.1%
Non-ind. sch.: 100%			Non-ind. sch.: 100%		



The questions:



Headline impact: UCAS evaluation



1. Does Isaac & STEM SMART engagement result in **raised aspirations**?



2. Does Isaac & STEM SMART engagement result in **raised attainment**?



3. Does Isaac & STEM SMART engagement result in **improved outcomes**?

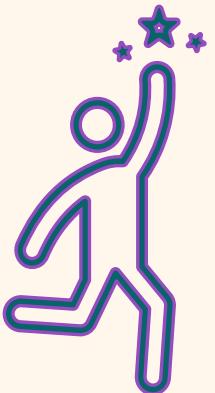


Over **96,000** students were included in this evaluation



The answers:

1. Raised aspirations





1. Raised aspirations



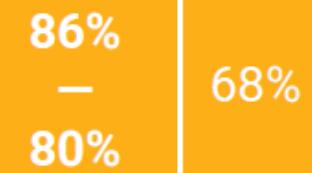
1. Does Isaac & STEM SMART engagement result in **raised aspirations**?

APPLIED TO THE RUSSELL GROUP

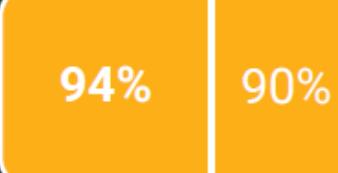
Engagement
High
—
Low

Where differences are significant

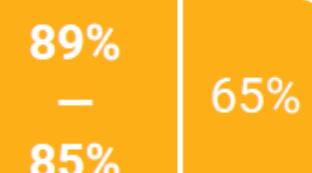
Isaac 1 Control



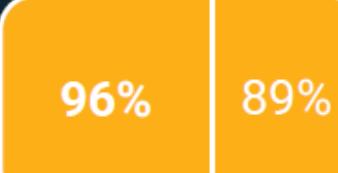
SMART 1 Control



Isaac 2 Control

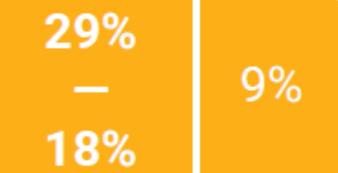


SMART 2 Control

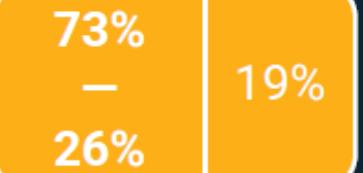


APPLIED TO OXBRIDGE

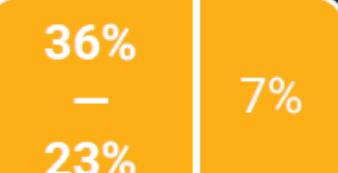
Isaac 1 Control



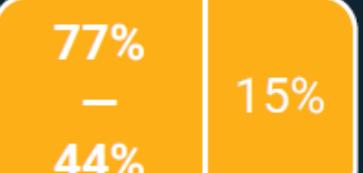
SMART 1 Control



Isaac 2 Control

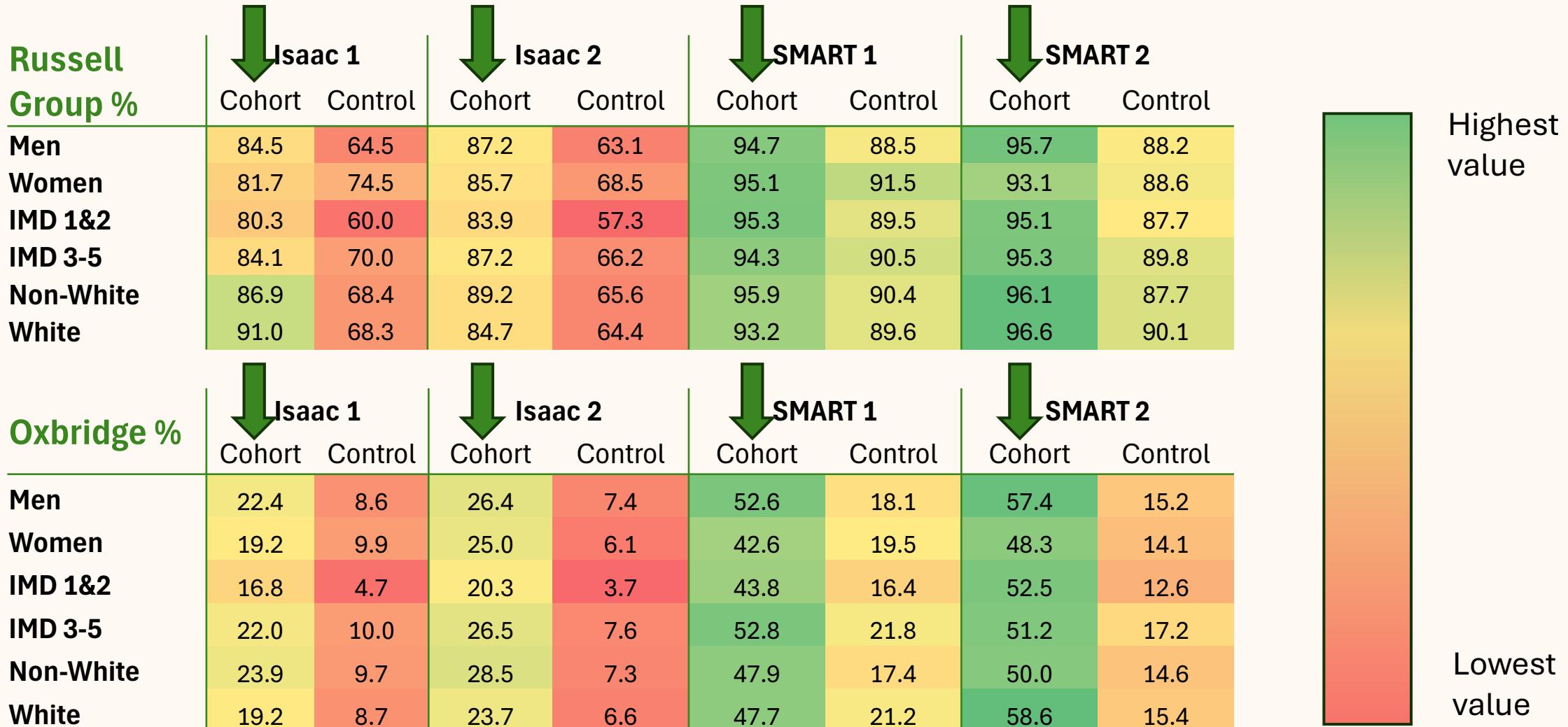


SMART 2 Control





1. Raised aspirations: by sub-group





The answers:

2. Raised attainment





2. Raised attainment



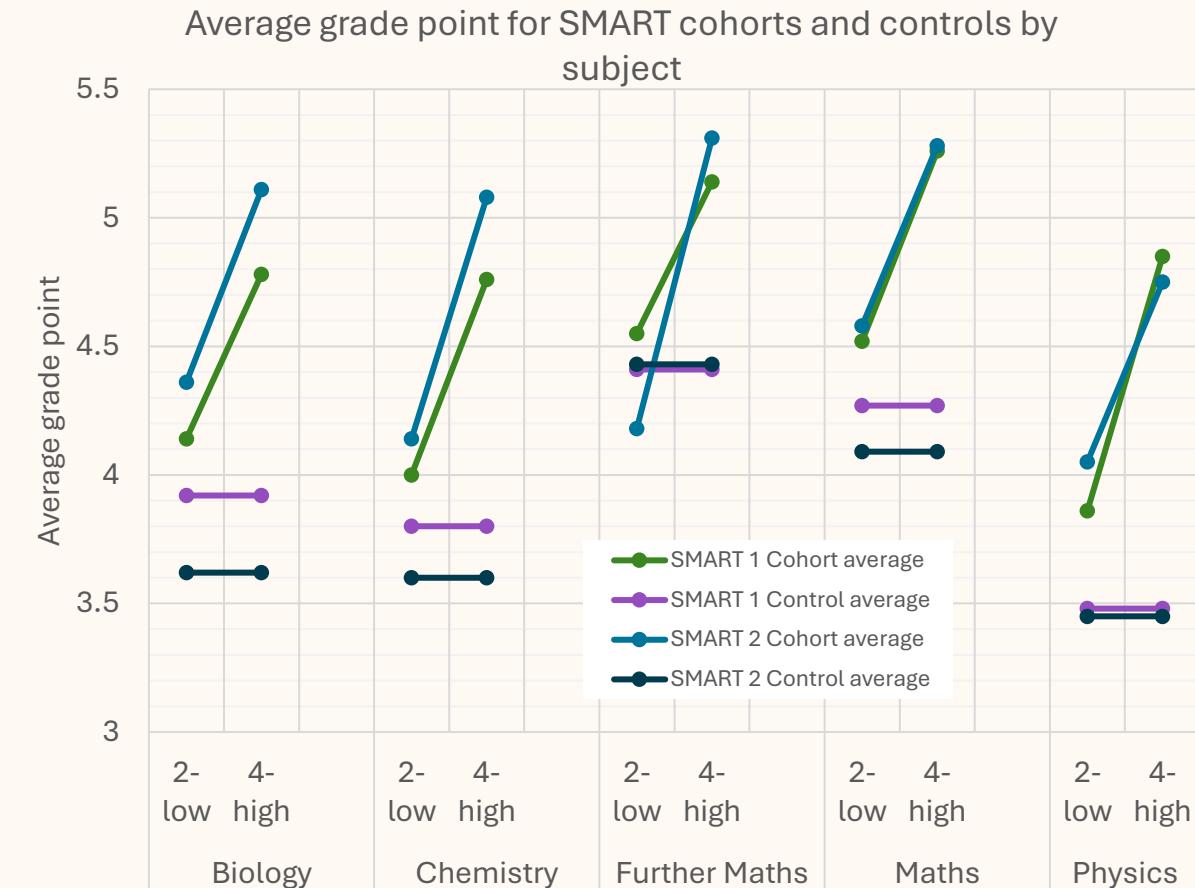
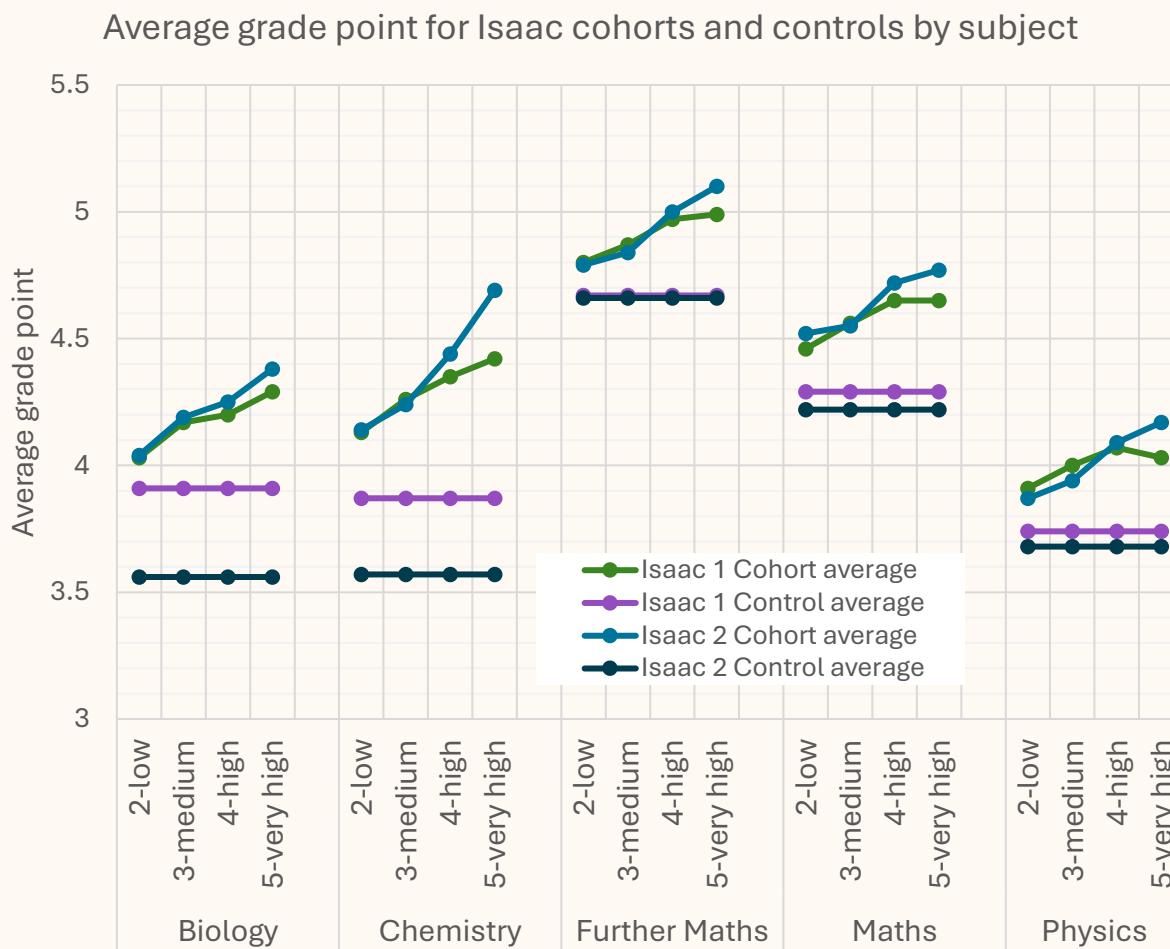
2. Does Isaac & STEM SMART engagement result in **raised attainment?**

Grade point differences to the control group
+1 = a whole grade
(e.g. B to A, A to A*)

	MATHEMATICS	F. MATHS	PHYSICS	CHEMISTRY	BIOLOGY
Isaac 1	+0.28	+0.22	+0.27	+0.39	+0.23
Isaac 2	+0.40	+0.33	+0.33	+0.75	+0.62
STEM SMART 1	+0.45	+0.37	+0.72	+0.52	+0.31
STEM SMART 2	+0.60	+0.29	+0.64	+0.65	+0.72



2. Raised attainment: Grade point averages by engagement level and subject





2. Raised attainment: most engaged

Differences	Biology	Chemistry	Further Maths	Maths	Physics
Isaac 1	+0.38 (B to A⁺)	+0.55 (B to A⁺)	+0.32 (A⁻ to A)	+0.36 (B⁺ to A⁻)	+0.29 (B⁻ to B)
V High – Control					
Isaac 2	+0.82 (B⁻ to B⁺)	+1.12 (B⁻ to A⁻)	+0.44 (A⁻ to A)	+0.55 (B⁺ to A⁻)	+0.49 (B⁻ to B⁺)
V High – Control					
SMART 1	+0.86 (B⁻ to A⁻)	+0.96 (B⁻ to A⁻)	+0.73 (B⁺ to A)	+0.99 (B⁺ to A⁺)	+1.37 (C⁺ to A⁻)
High – Control					
SMART 2	+1.49 (C⁺ to A)	+1.48 (C⁺ to A)	+0.88 (B⁺ to A⁺)	+1.19 (B to A⁺)	+1.30 (C⁺ to A)
High - Control					



The answers:

3. Improved outcomes

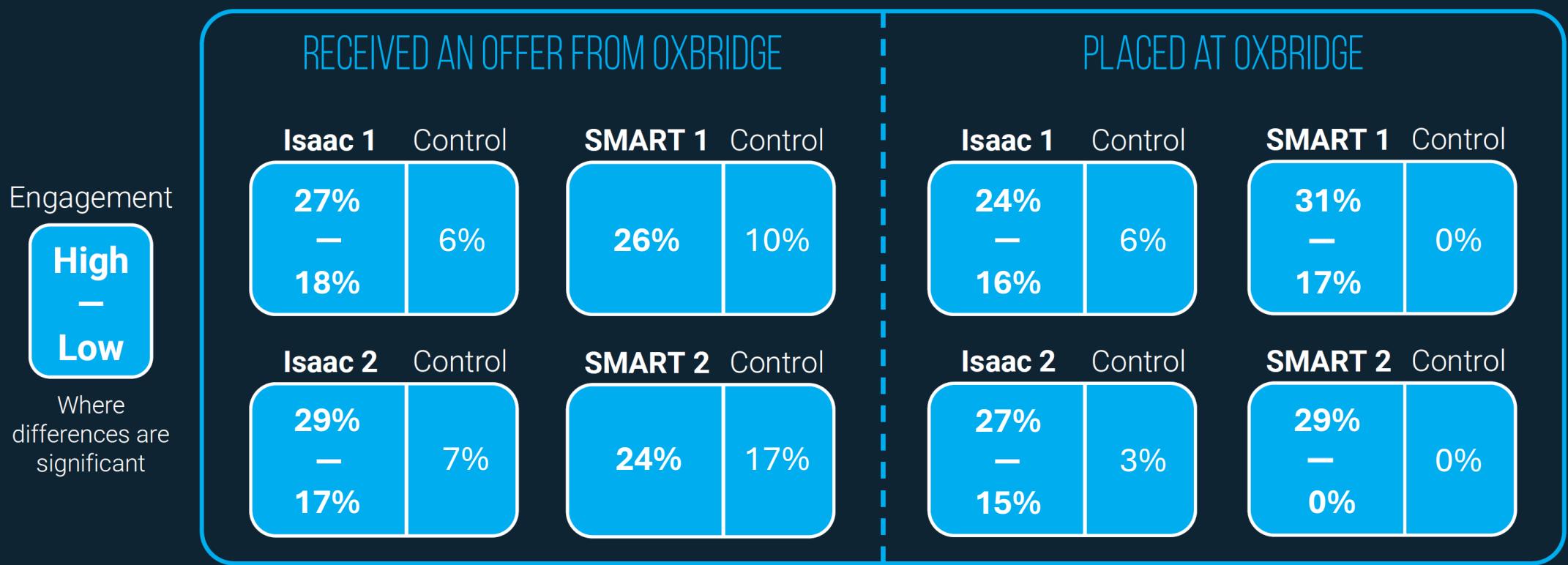




3. Improved Outcomes: STEM courses



3. Does Isaac & STEM SMART engagement result in **improved outcomes?**





3. Improved outcomes: STEM acceptance proportions by sub-group



Acceptance Proportions	F - Women		M - Men		IMD 1-2		IMD 3-5		Non-White		White	
	Cohort	Control	Cohort	Control	Cohort	Control	Cohort	Control	Cohort	Control	Cohort	Control
Selective												
Isaac 1	42.8%	27.9%	44.8%	30.0%	40.7%	26.9%	47.8%	31.0%	41.8%	25.3%	49.0%	32.6%
Isaac 2	42.8%	28.2%	44.9%	29.6%	41.1%	27.1%	47.5%	31.0%	42.6%	24.0%	48.5%	33.4%
SMART 1	42.3%	28.6%	54.8%	32.2%	46.9%	29.0%	46.2%	32.2%	45.7%	26.4%	52.2%	36.8%
SMART 2	38.5%	26.9%	34.6%	33.3%	35.5%	30.7%	40.9%	29.9%	32.4%	26.1%	46.7%	38.9%
Oxbridge												
Isaac 1	18.1%	0.0%	19.2%	4.3%	12.9%	0.0%	21.2%	4.2%	17.5%	5.3%	21.5%	6.7%
Isaac 2	20.5%	0.0%	21.0%	4.8%	14.7%	0.0%	23.9%	5.3%	21.6%	6.3%	22.8%	7.1%
SMART 1	11.1%	0.0%	28.6%	0.0%	16.7%	0.0%	27.3%	0.0%	18.8%	0.0%	28.6%	0.0%
SMART 2	12.5%	0.0%	18.2%	0.0%	8.3%	0.0%	12.5%	0.0%	7.7%	0.0%	33.3%	0.0%





3. Improved outcomes: Destinations

Top 20 universities and courses accepting Isaac engaged students in 2023 & 24 – (Isaac 2)



University	Isaac 2 acceptances	Courses	Isaac 2 acceptances
University of Cambridge	985	physics	1735
Imperial College London	590	mechanical engineering	1590
University of Nottingham	550	engineering (non-specific)	1225
University of Bath	500	aeronautical and aerospace engineering	930
University of Sheffield	475	chemistry	775
University of Oxford	465	civil engineering	515
University of Southampton	410	electrical and electronic engineering	505
University of Bristol	395	chemical, process and energy engineering	490
Durham University	395	biomedical sciences (non-specific)	460
University of Manchester	360	pharmacy	305
University of Birmingham	305	molecular biology, biophysics and biochemistry	305
University of Liverpool	295	biology (non-specific)	280
UCL (University College London)	295	production and manufacturing engineering	275
University of Leeds	275	astronomy	250
Cardiff University	260	biosciences (non-specific)	215
Newcastle University	255	materials science	175
University of Warwick	240	bioeng, medical and biomedical engineering	155
University of Exeter	220	natural sciences (non-specific)	150
Swansea University	210	earth sciences	120
King's College London = University of York	190	pharmacology	105

Questions?

