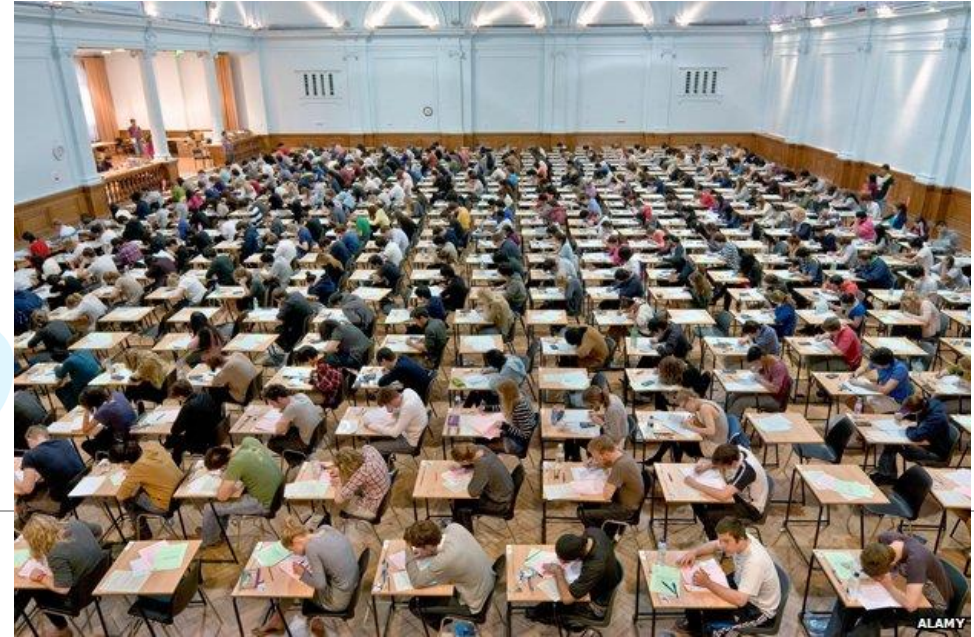
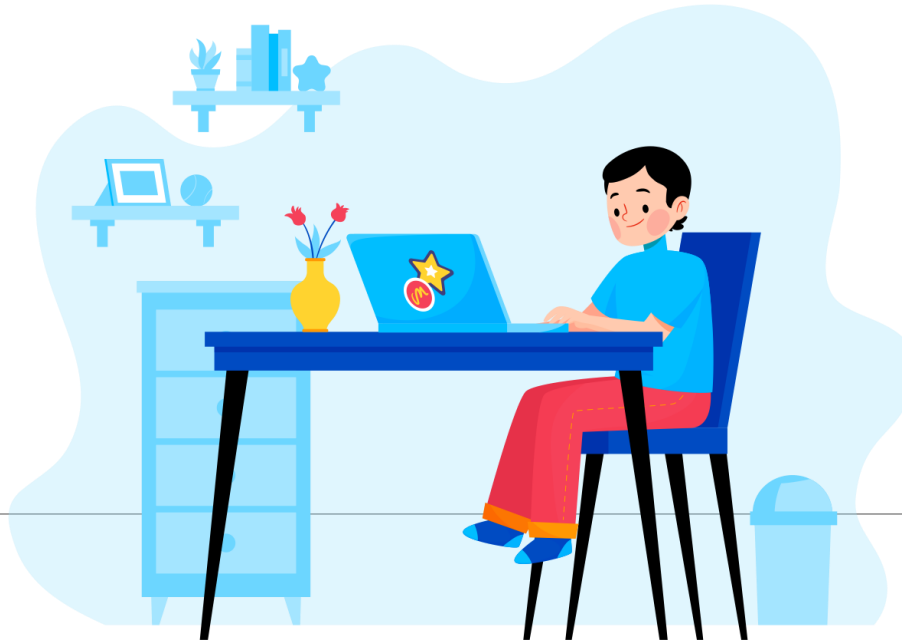


Should Open-book Open-Web exams replace closed-book exams in STEM?



Natural Sciences Scholarship of Teaching and Learning Webinar

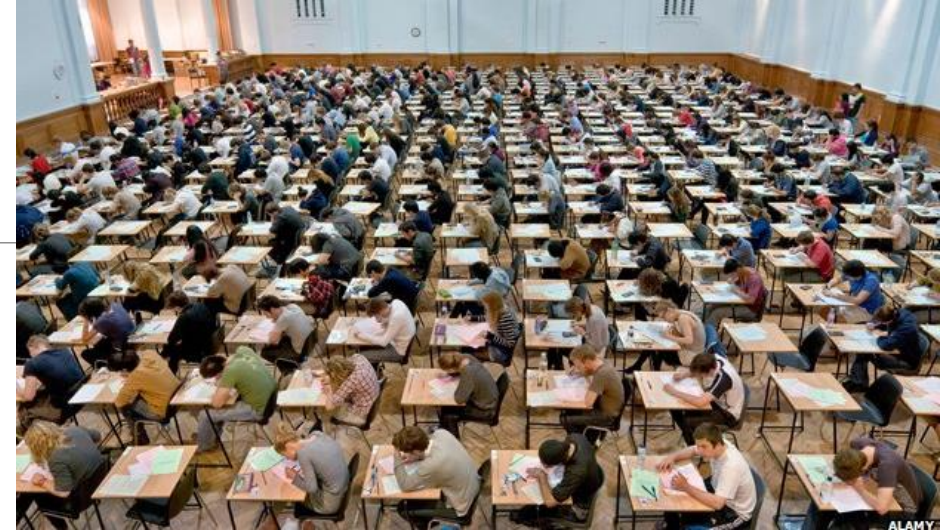
Dr Laura Roberts
Director of Learning and Teaching, Science

Dr Joanne Berry
Dean of Assessment and Feedback



Research aims

1. Evaluate the **student experience** of open-book, open-web assessment in STEM disciplines
2. Provide **evidence-based guidance** to support **future assessment policies** in STEM



Emergency Remote Teaching and Assessment

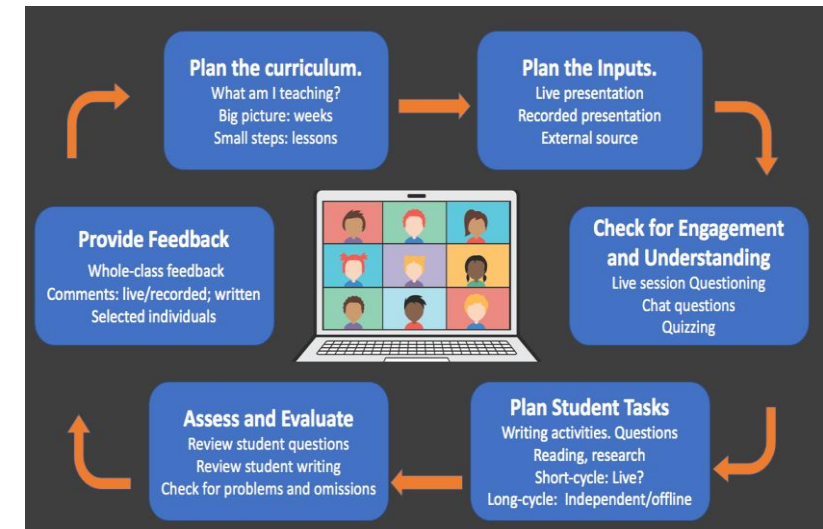
Temporary shift of instructional delivery¹

Intention to return once the crisis has abated

Objective was not to re-create a **robust educational ecosystem**

Benefits have arisen from a more blended design, e.g. OBOW exams to replace CBE

But can OBOW exams robustly replace CBE for all subjects and assessments in STEM?



CBE vs. OBOW

Closed Book Exams	Open-Book, Open-Web
High pressure	Moderate pressure
Focus on rote learning and retrieval	Concepts over facts
Embed long-term memory and deeper learning	Less emphasis on memorising
Robust and test individual knowledge and skills	Critical and creative thinking
Factual and critical analysis	Intellectual skills
Short duration	Variable duration
Important educational milestones	Organisation and time management
Encourage engagement	Considered more real-world
Motivators for learning	Negatively impact engagement
Limit Academic Misconduct	Increases Academic Misconduct



VALID

It is accurately assessing the learning objectives.



FAIR

It is a fair assessment for all learners.



RELIABLE

It is easily understood and assessed by others.



AUTHENTIC

It is true to the discipline and is students' own work.

by users Eucalypt and Pixelmeets on Flaticon.

If OBOW exams replace CBEs across STEM it is essential to assess:

- How did OBOW exams impact learning?
- How did teachers and students adapt?
- **Students perspective on the experience**
- Where do we need to improve should we take OBOW exams further?

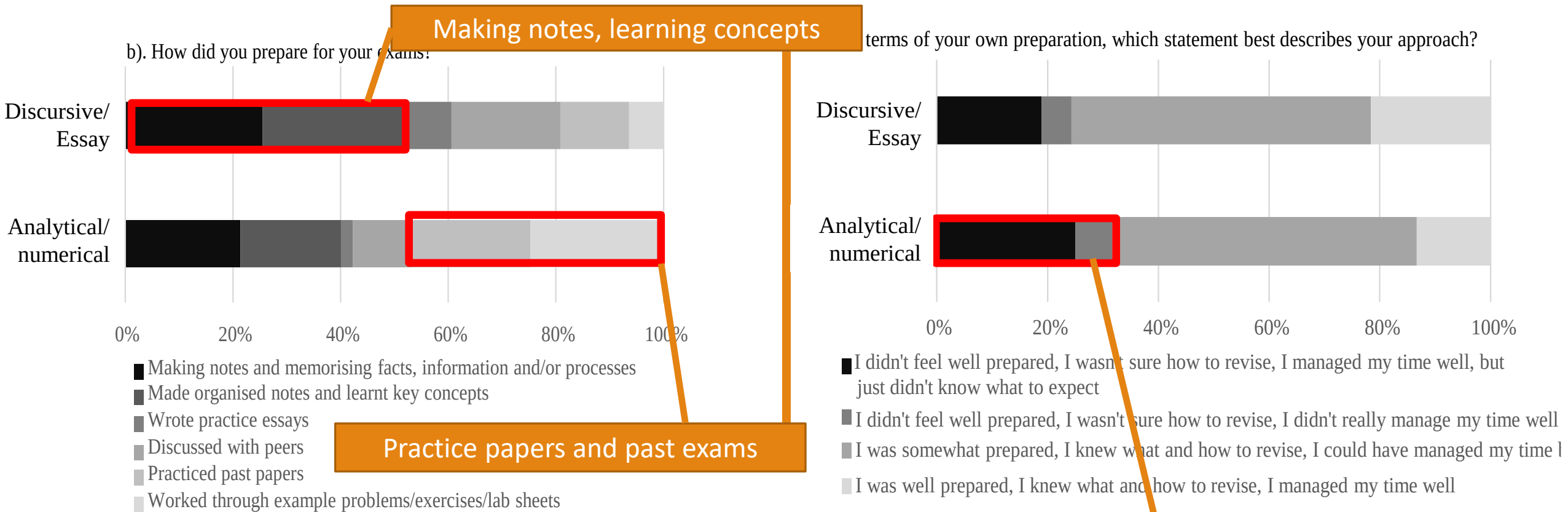
OBOW benefits	OBOW Challenges
No campus space needed	Robustness of design
Reduced costs (e.g. invigilators)	Teaching and assessment alignment
Easier marking	Academic Integrity
Enhanced feedback	
Enhanced authenticity	

Research methods

Student survey: Evaluate the experience of OBOW exams on students in six different STEM disciplines (April 2021):

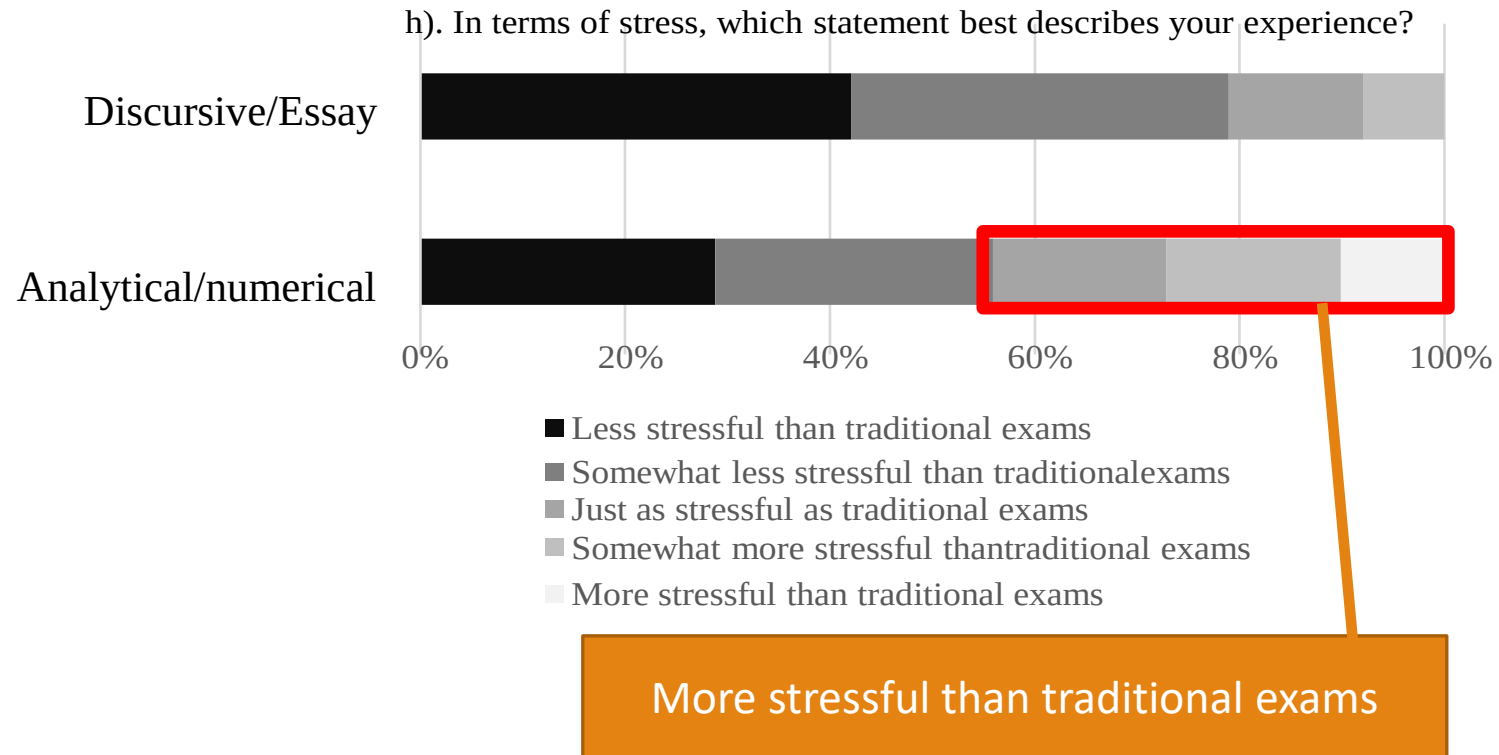
1. General information
2. Preparation and Revision
3. The Exam
4. Student Learning

Discursive essays	Analytical/numerical problem-based exams
Biosciences	Chemistry
Geography	Computer Science
	Maths
	Physics
2 hour exam	2 hour exam
2 hour submission window	2 hour submission window
N = 37 responses	N = 60 responses

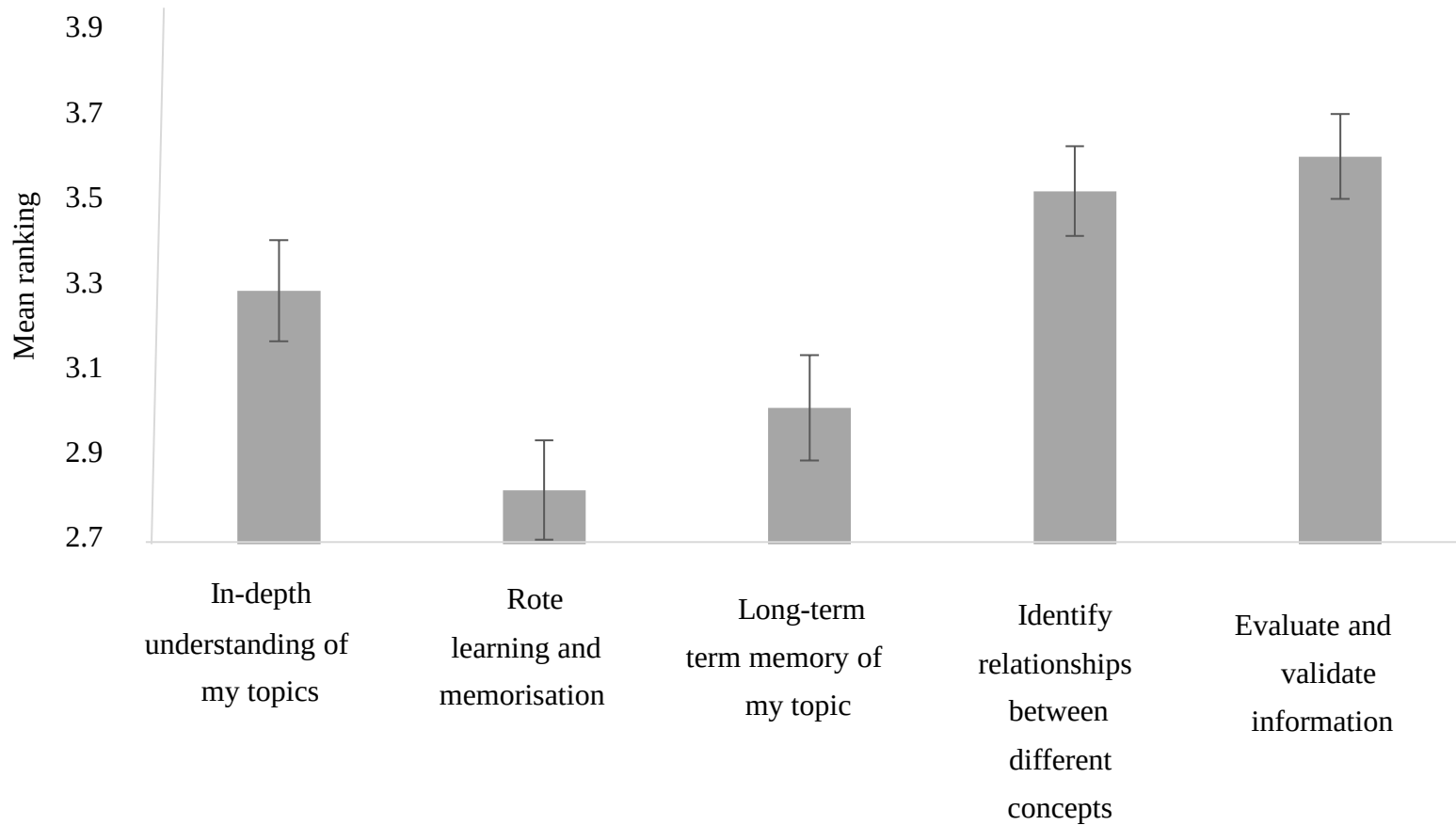


Preparation and revision

The OBOW exam



Development of Higher Order Cognitive Skills



Did learning differ during the revision?					
	A	D		A	D
Better understanding of concepts	4	4	Did not learn	1	2
Better long-term memory	0	2	Learnt less than a formal exam	1	0
Less formal	0	1	Learning lost faster	1	0
Lecture recordings beneficial	0	1	More general	0	1
Less formal	0	1	Loss of discipline/motivation	3	1
Less stressful	2	1	Peer isolation	0	1
More flexible	0	1	More work	0	1
More independent	0	1	Harder	2	0
Better referencing	1	0	Lecturers disrupted/difficult	2	0
Less memorising	7	4	Home disruptions	1	0
			Poor quality teaching	3	0
			Teaching not adapted to new approach	1	0
Total	14	16		15	6

Impacts on employability?	A	D		A	D	
More real world applications		5	5	Nothing	11	5
Write faster essays		0	1	Less rigorous, devalued degree	0	1
Time management		0	2			
Identify and prioritise/evaluate info		6	4			
Read more resources		0	1			
Learn independently		0	1			
Better organisation		1	2			
Able to deal with multiple deadlines		0	2			
Critically analyse information		0	1			
Stress management		1	0			
More remote jobs available		1	0			
Better work/life balance		1	0			
Total		15	19			11

Anything to add?	A	D			
Prefer relaxed environment	0	2	Bad experience	2	0
Less overloaded	0	1	Devalued degree	1	0
Show more in-depth knowledge	0	1	More stress as fewer past papers	2	0
Fewer mistakes	0	1	Less confident	1	0
Real-world skills	3	0	Harder exams due to less guidance	1	0
Less memory focused	0	1	Disconnect between teaching delivery ar	2	1
Way forward	1	0	Less effective	1	0
Helped mental health	1	0	Harder to prepare for	1	0
			Not a university experience	0	1
			Less motivated	1	0
Total	5	6		12	2

Anything you would like to add about the OBOW exams:

Biosciences:

Exams at home is illogical, and easily cheated

Group calls during the exam allow students to share ideas freely

Exam was not a significant indicator of comprehension or understanding

Nice to be able to make coffee during the exam

It felt a lot more relaxed, but in the future it would be nice for more spaces to be allocated on campus

I genuinely preferred the format of the exams and thought they tested your ability to interpret the question and provide evidence (references and case studies) much better than normal exams

However, completing them at home was so stressful and unfair to assume people are able to do this (wifi issues, family issues, noise)

Extra time was essential

Physics:

- Please proof read the exams, as many of them had typos and strangely formatted question numbers.
- Having the lecturer accessible during the exam was invaluable

Chemistry

- The more familiar and relaxed environment made it easier to focus on the exam without the pressure and the nerves caused by waiting outside an exam room.

Computer Science:

- Living in a student house meant that the internet was unreliable during exam periods
- The university seems quite out of touch when it comes to how students actually study, and what tools are available to them. The advice given is mostly useless
- Typing and drawing diagrams digitally takes a vastly longer amount of time, and not everyone has the tools or programs necessary to do it efficiently.

Maths:

- Mismatch between expected and given time

Key findings:



Variation between STEM disciplines in the experience of remote exams based on question type



Discursive/essay-based disciplines more favourable than analytical



Analytical: underprepared, unsure, undervalued, many did not identify the long-term employability benefits, teaching needs more adaptation



Discursive disciplines identified the real-world applications



Presents a challenge for aligning OBOW exams with top-down assessment principles

Study limitations

Other confounding factors not assessed:

- Academic integrity
- Extenuating Circumstances
- Supplementaries
- Administrative errors



Conclusions: Should Open-book Open-Web exams replace closed-book exams in STEM?

Not suitable for all assessment types in their current form

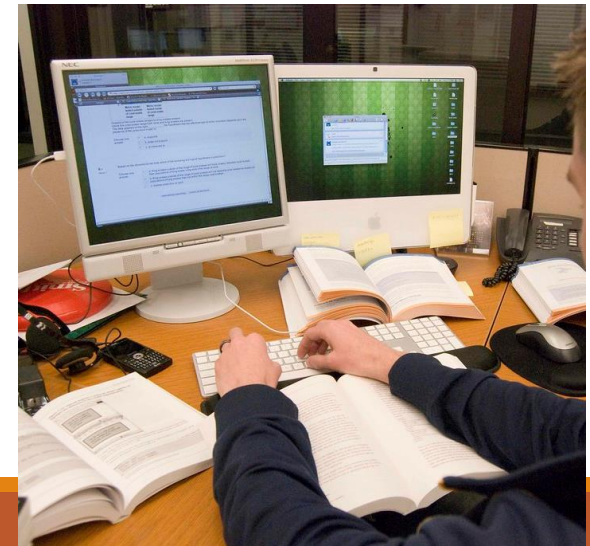
Effective for developing intellectual skills in a discursive setting

Real-world applications – require acknowledgement

Discipline-specific preparation required

Use if authenticity, rigour and reliability can be confirmed

A range of carefully designed, diverse, applicable and inclusive assessment methods is advisable





Discussion time

What have been the assessment strategies coming out of the pandemic in your subject areas?

What have been the challenges and how have they been overcome?