Enhancing Practical Learning in Postgraduate Education:
Integrating Digital Tools and Team-Based Learning in MSc Medical Microbiology

Dr Hannah Serrage, Dr Stavros Panagiotou, Dr Jenny Herbert and Dr Moustafa Alissa Alkhalaf

MSc Medical Microbiology Programme

MANCHESTER 1824
The University of Manchester

MSc Medical Microbiology

2024 – 2025: 42 students

Diverse cohort comprising 78% international students (24/25)

6, 15-30 credit modules

Provision of asynchronous and synchronous content

Enhance accessibility of content through flexible approach to learning

ID: MSc Medical Microbiology logo

Practical microbiology

15 credit, 3-week module

An intensive introduction to key microbiological techniques

Research and microbiological techniques

Complemented by guided tutorials and drop in sessions

ID: Agar plate inoculated with *Staphylococcus aureus* with the words ‘MSc Med Micro’

Practical microbiology: the issues

Diverse cohort with varied microbiology experience

Traditionally guided by paper protocols

Passive learning with little room for critical thinking

Student understanding is poor, which hinders learning throughout the programme

What can we do to improve this?

ID: Agar plate inoculated with bacteria depicting flowers and words.

Enhancing Practical Microbiology

Aim: To enhance active learning and critical thinking across practical microbiology

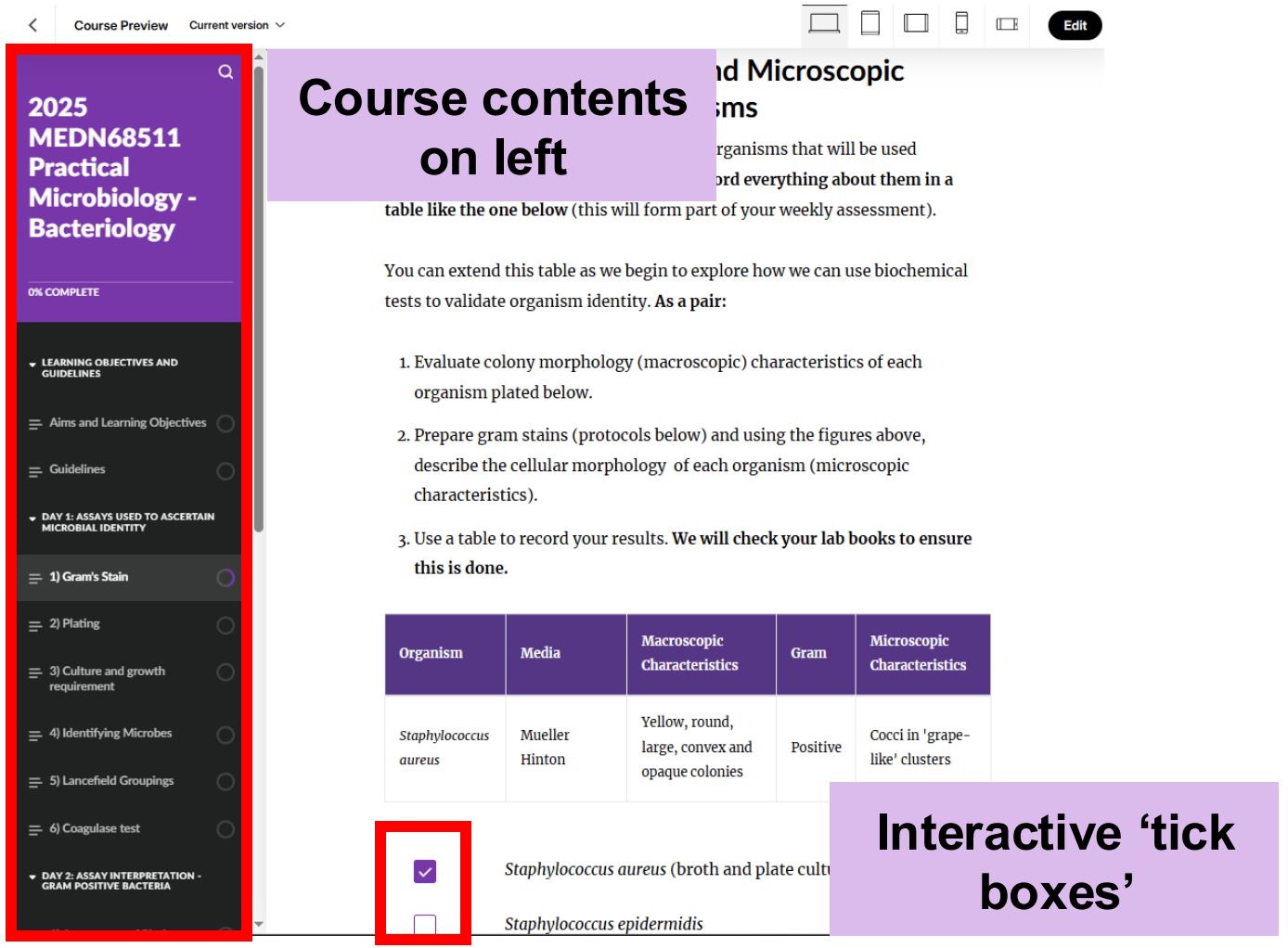
Reinvigorate learning resources	Consolidate and apply learning	
Articulate Rise 360	**Mentimeter**	**LAMS**
Interactive handbook with opportunities for self-assessment	**Use of interactive polls to review understanding and experimental outcomes**	**Series of multiple-choice questions (MCQs) and application exercises**

Reinvigorating Learning Resources

Distributed both a standard laboratory handbook and digital e-handbook to students

Students were given the option to use either resource, or both

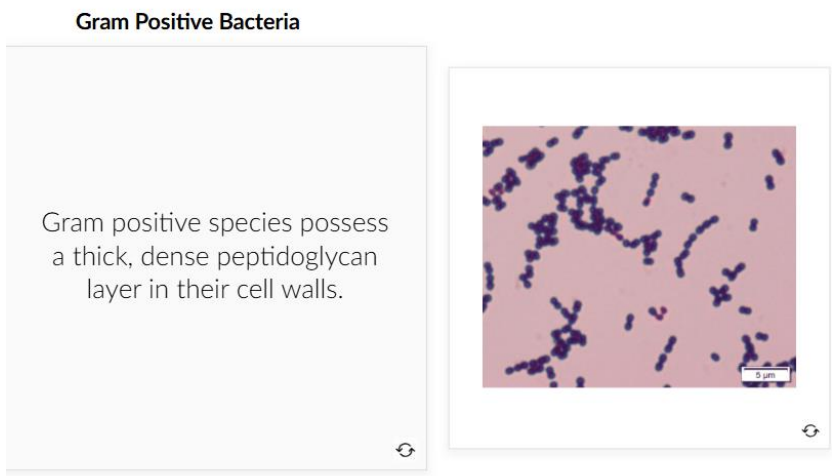
All information was the same, but interactive content available in e-handbook



Reinvigorating Learning Resources

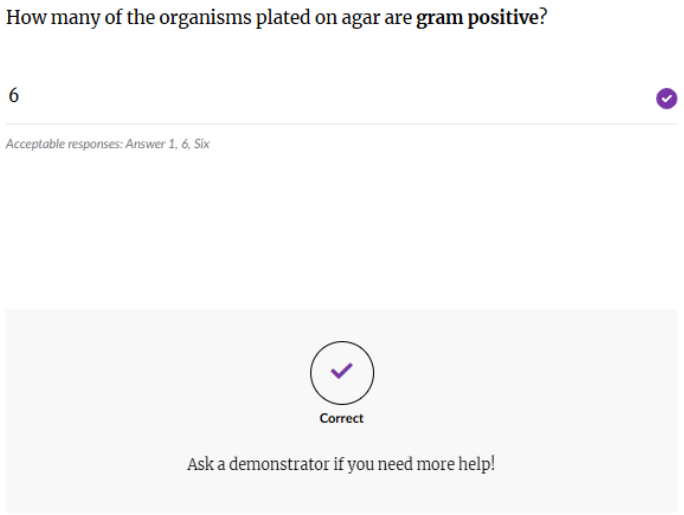
E-handbook interactive content included:

Flash cards



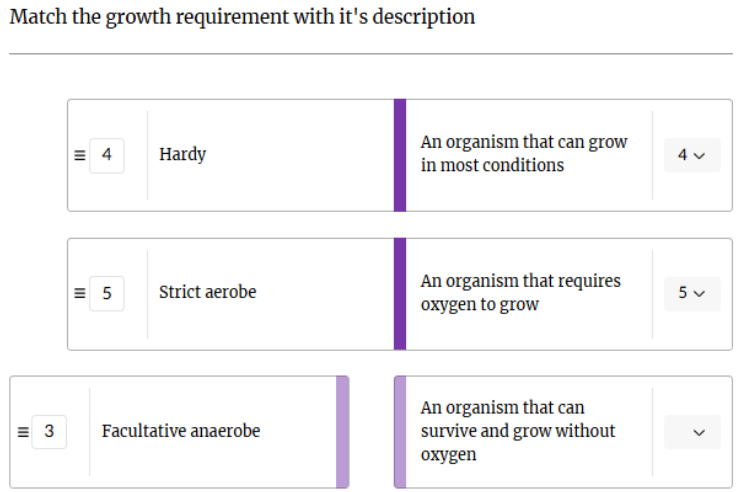
Flash cards that ‘flip’ with image descriptions

Practice Questions



Open ended or multiple-choice practice questions

Matching exercises



Match the item with its description

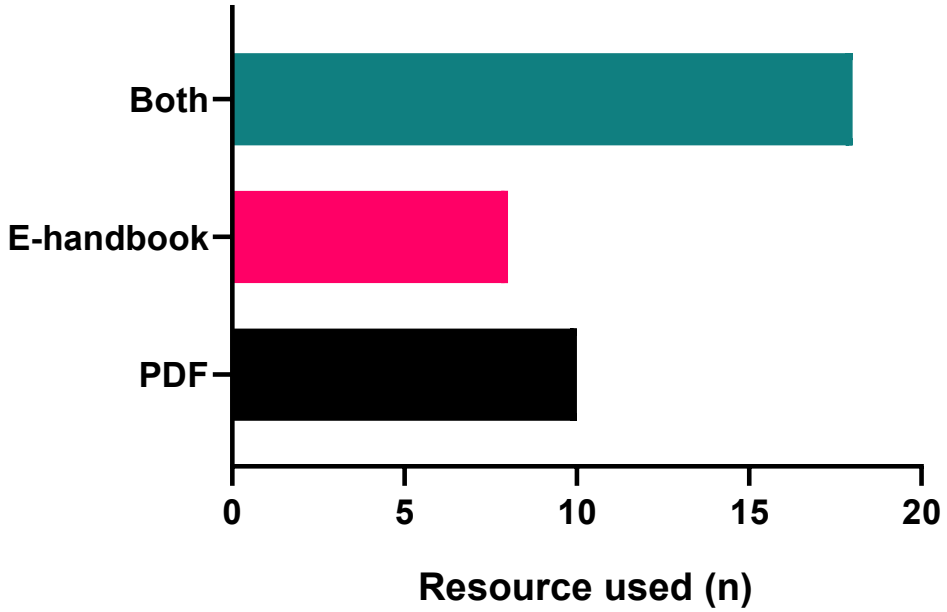
Learning Resources: Student Opinion

85% of students responded to survey

50% students exploited both resources simultaneously

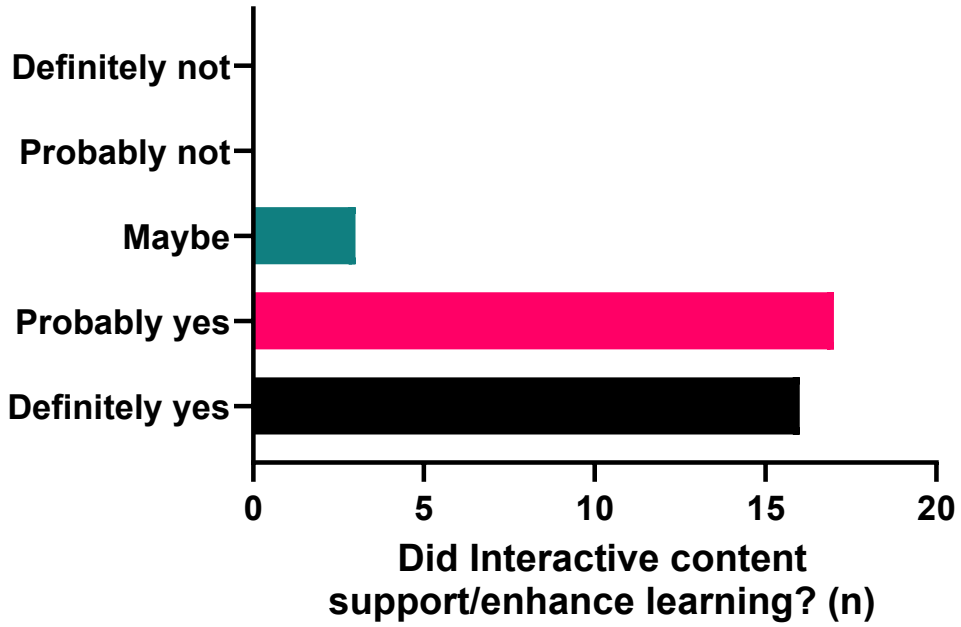
Indicating that the standard handbook was ‘easier to take notes on’

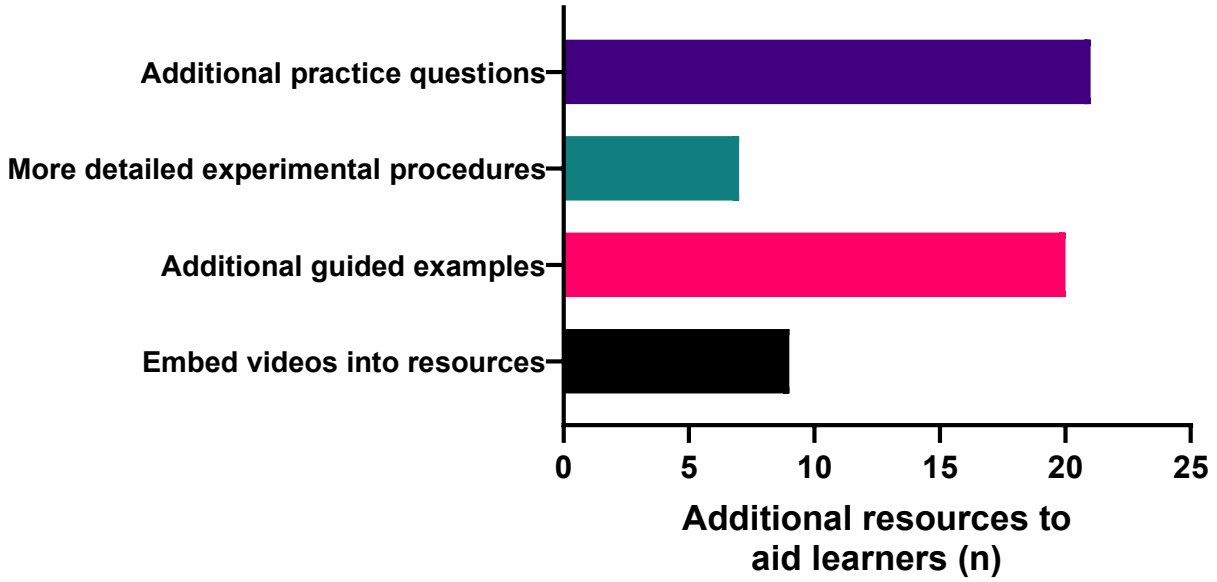
But interactive content, such as practice questions in the e-handbook, proved invaluable



Students used both resources to guide their learning

Learning Resources: Student Opinion





Students were very positive about interactive content

Felt additional improvements were required to improve learning outcomes

Learning Resources: Outcomes

Rise articulate allows for self-paced learning

Students enjoyed interactive content, but felt paper protocols were still important for writing notes

Additional interactive content has been requested for students to continue to practice in their own time

How can we consolidate learning from practical sessions?

Consolidate and Apply Learning

Previously experimental outcomes were not discussed or disclosed

Resulting in poor student understanding and a lack of consolidation

Incorporated Mentimeter and LAMS into learning

Focus on LAMS today: interactive platform to consolidate learning

ID: QR code to redirect to menti.com, code 3616 3032

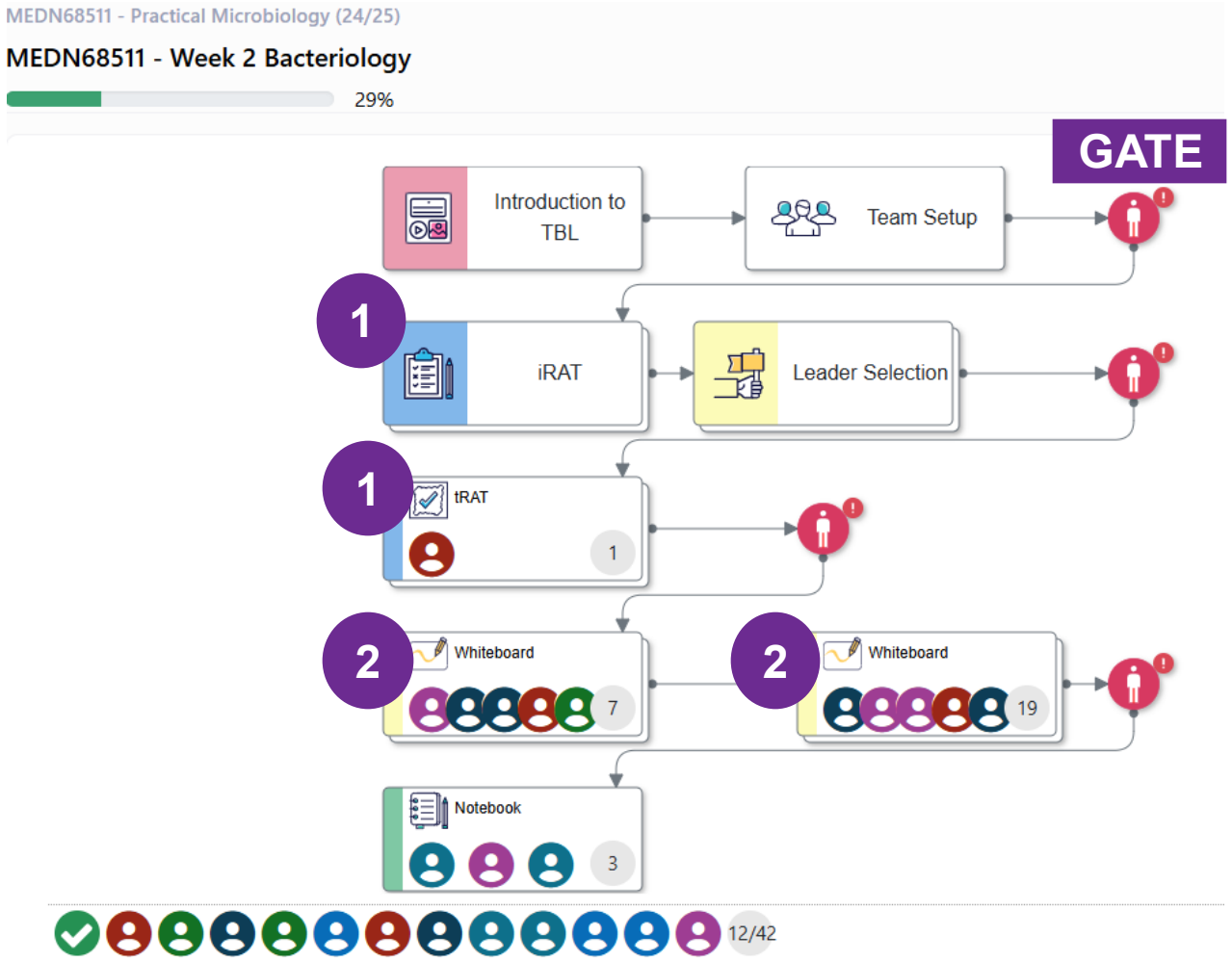
Consolidate and Apply Learning: LAMS

Team based learning

Built like a flow chart with ‘gates’

Task 1: A series of MCQs to be undertaken independently (iRAT) then in assigned groups (tRAT)

Task 2: Application exercise(s) based upon content covered that week



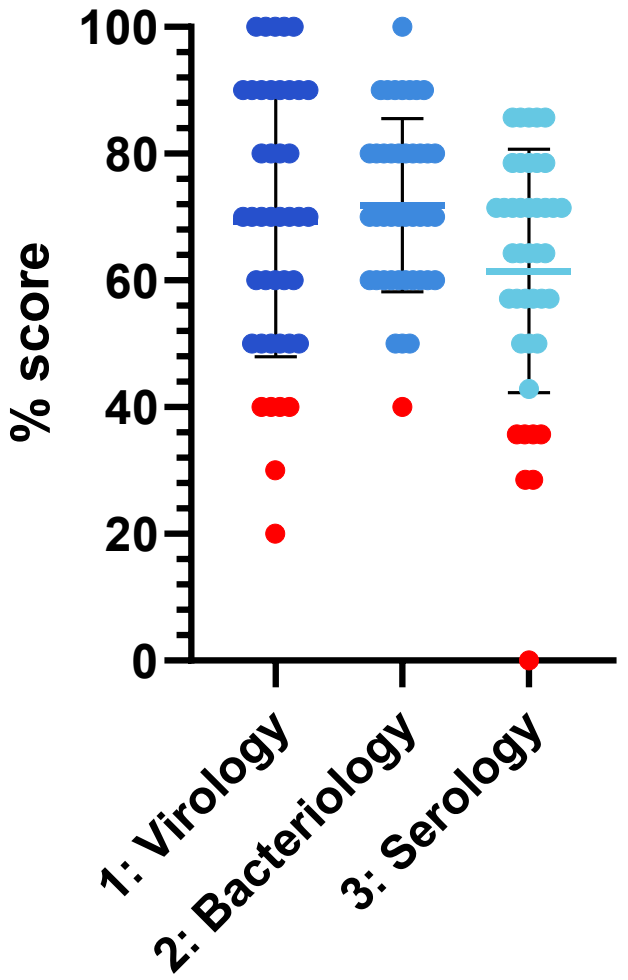
LAMS: MCQs, independent

Assess student scores in real time

Identify candidates that score consistently lower than peers

Graph showing weekly performance on MCQs, where red dots achieved <40%

Can identify students that might need help, very early in the programme

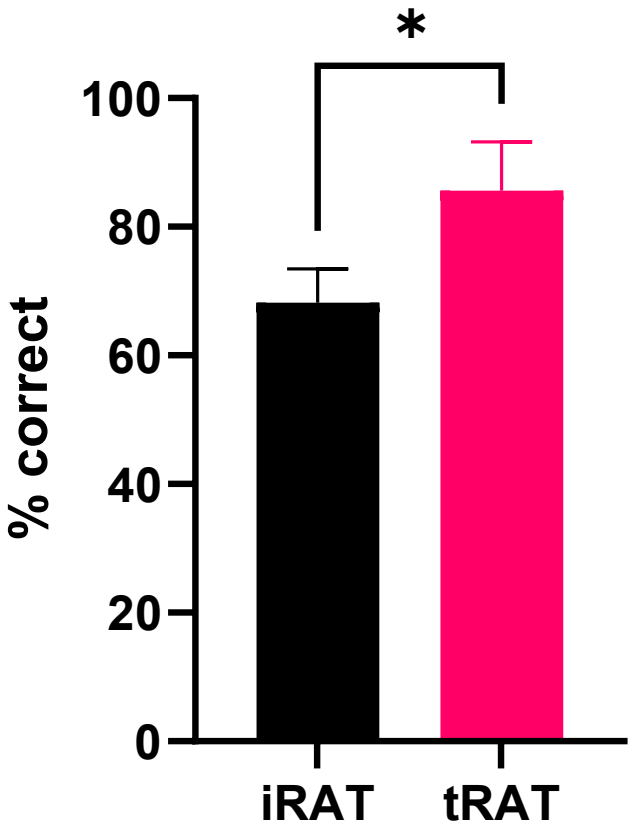


LAMS: MCQs, team-based

After independent completion, students answer the same questions as a team

This enables discussion and reinforces learning

Average scores tend to increase when completed as a team (average over 3 weeks)



LAMS: Application exercises

MCQs showcase knowledge of content but not understanding

Application exercise provide another opportunity to collate complex information

Use LAMS whiteboard function to collate information in groups

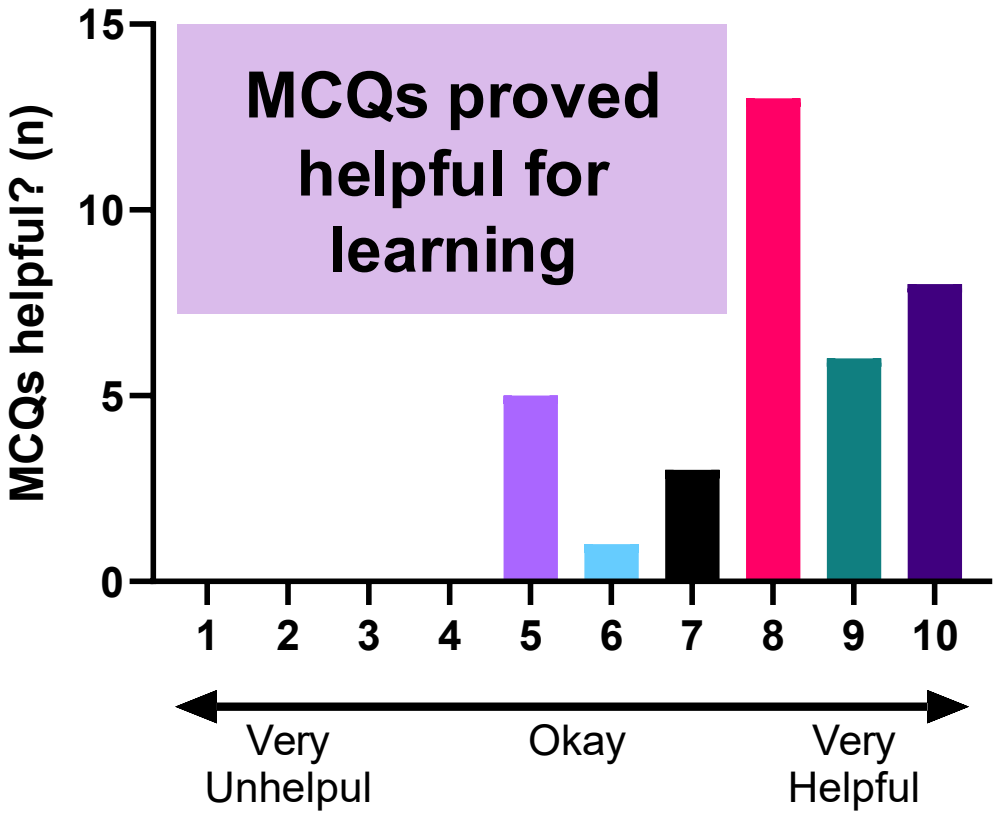
Students asked to summarise information pertaining to specific bacterial species

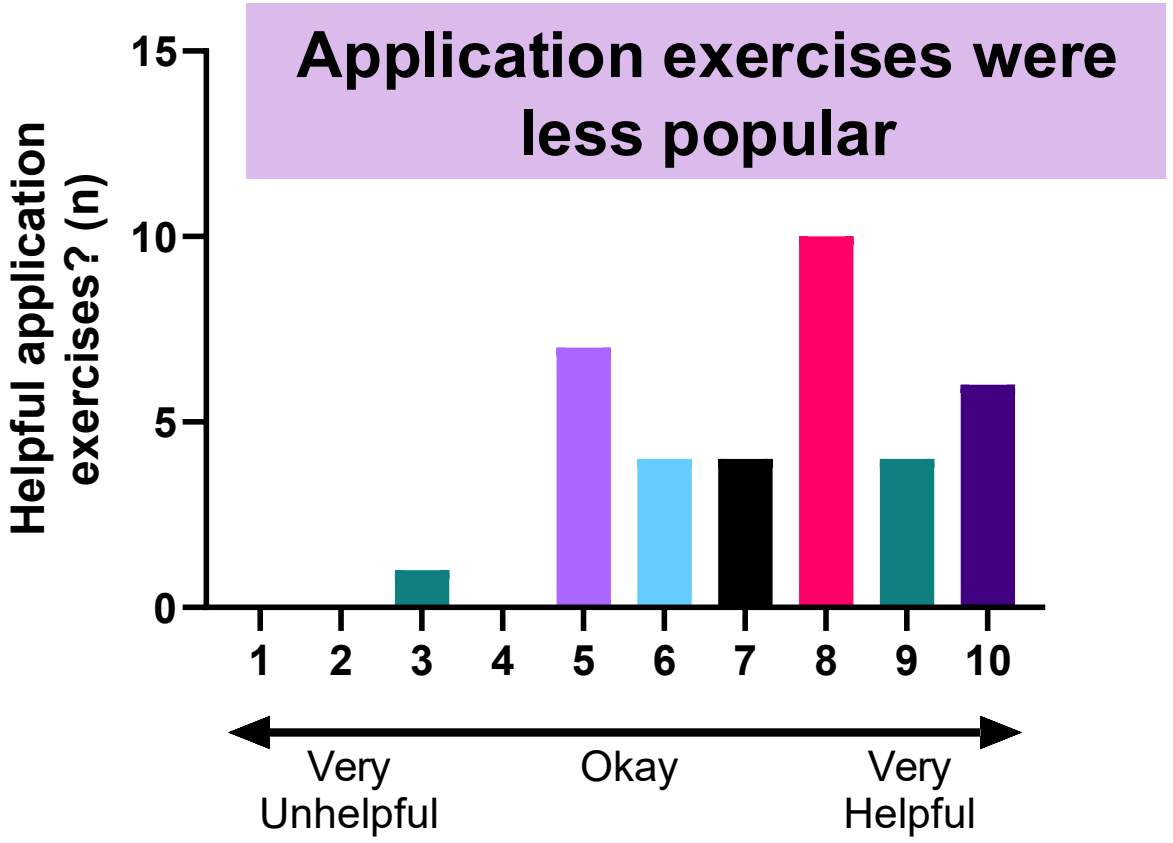
•	Genus and Species	Agar and colony morphology/characteristics
W	Pseudomonas Aeruginosa	green, metallic,
E	Staphylococcus epidermitis	pink, no yellow agar
L	Staphylococcus aureus	yellow
C	Escheria coli	Pink, lactose fermenter
O	Klebsia pneumonia	pink
M	Streptococcus pneumonia	alpha hemolysis
E	salmonella spp	bright pink, black colonies
☺	moraxella catarrhalis	grey, fastidious

Asked students to identify 8 different bacteria spelling ‘WELCOME ☺’

LAMS: Student opinion

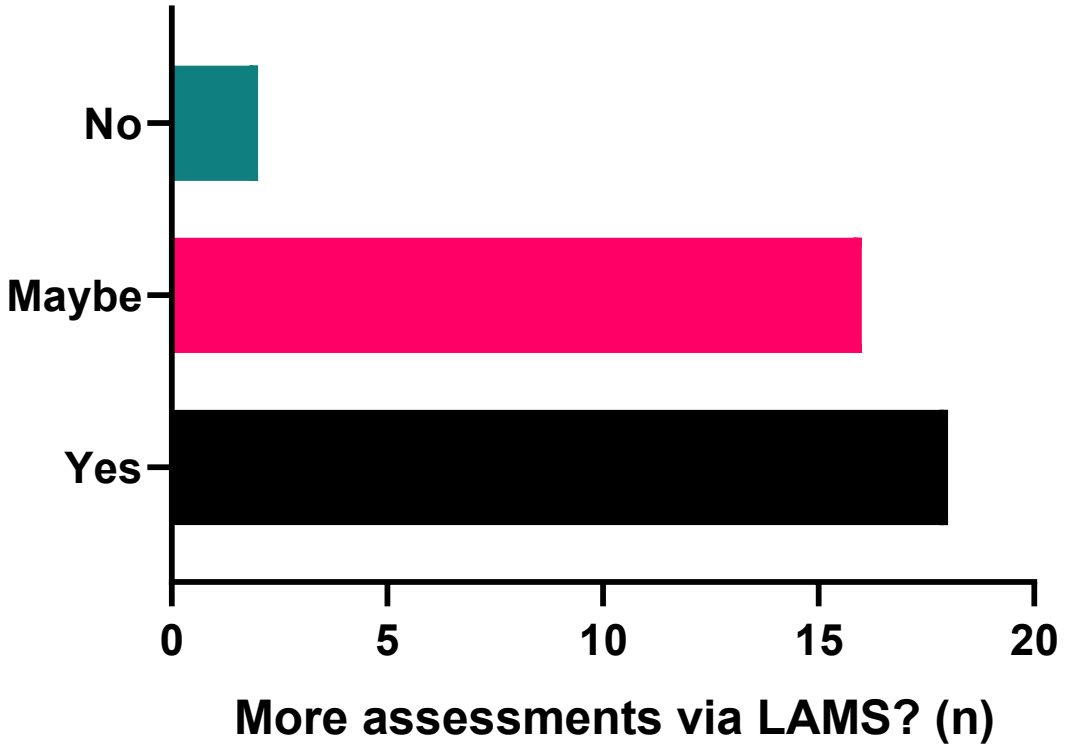
85% of students responded to survey providing opinions on the use of LAMS





LAMS: Outcomes

- Students were generally positive about LAMS
- Application exercises require restructuring
- 50% students wanted more formative assessments on LAMS
- We can identify students that require additional support



Digital Resources: Outcomes

Students were positive about incorporation of additional resources

Both LAMS and Rise resources require improvements following student feedback

Continue to improve to enhance student experience!

Thank You!

hannah.serrage@manchester.ac.uk

MSc Medical Microbiology
UNIVERSITY OF MANCHESTER