Picture this. Image based situational judgement in biomedical science education

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Introduction

Laboratory teaching in Biomedical Science often delivers the most meaningful learning when experiments do not go as expected. Unexpected outcomes challenge students to think critically, analyse errors, and deepen their understanding of underlying scientific principles.

At the University of Lincoln, we have developed an online assessment approach using "unexemplars", deliberately incorrect or suboptimal laboratory results and practices. Rather than showing best practice, unexemplars highlight *what not to do*, requiring learners to diagnose problems and reflect on correct methodology.

In our second-year immunology module, unexemplars were drawn from real student errors in practicals. These examples were collated into a situational judgement-style online exam using a single best answer format, where students evaluate flawed outcomes under timed conditions picking the most appropriate response.

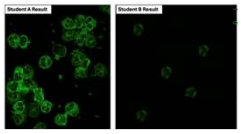
This approach moves assessment beyond traditional lab reports by directly testing decision-making and critical analysis. In an era where artificial intelligence is reshaping assessment, unexemplars provide a way to ensure authentic evaluation of genuine knowledge acquisition. By embedding adaptability and critical reasoning into assessment, we equip the next generation of biomedical scientists with skills that matter most in practice

Assessment Design and Examples

Students interpret and troubleshoot results, and link their findings to clinical decisions. The tasks are aligned with HCPC Standards of Proficiency, including the application of scientific knowledge, analytical and practical skills, quality control principles, and accurate interpretation of results.

Example 1:

Two students are running the Indirect Immunofluorescence for patient 1 from the clinical simulation laboratory, their results are shown in the images below. You compare the two results and review the laboratory records. You confirm that the correct reagents and dilutions were used by both students, and the microscope settings have not changed. Apply your knowledge of the indirect immunofluorescence protocol to identify the most likely cause of the discrepancy between the results. You may only select ONE answer.

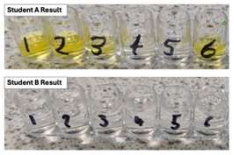


A	Student B did not complete the secondary antibody incubation in the dark resulting in photobleaching of their results.	50%
B	Student A did not wash their sample sufficiently resulting in non-specific binding of the secondary antibody with no identifiable ANCA pattern	0%
C	Student A used a more robust fluorophore resulting in less photobleaching and a clearer result than Student B	20%
D	Despite being produced in the same batch, the slide used by student B did was not properly fixed in ethanol resulting in incomplete staining	30%
E	The artefacts seen in Student B's slides are due to autofluorescent objects not true fluorescence	0%

Example 2:

Two students (A and B) are repeating the MPO Enzyme Linked Immunosorbent Assay (ELISA) assay that you ran in the clinical simulation session for patients 1 and 2. Before reading the samples on the plate reader they compare their results.

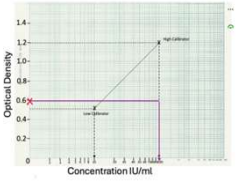
Taking into account your knowledge of ELISA and your own result for MPO ELISA for patient 2. What is the **most likely** explanation for the discrepancy between the results for student A and student B? **You may only select ONE answer.**



A	Student B did not add MPO antigen to the wells	50%
B	Student B did not add PR3 antigen to the wells	0%
C	Student A performed the wash steps accurately	0%
D	Student B washed the antigen off the ELISA wells due to additional, excessive wash steps after the first incubation	30%
E	Student B only ran the negative control	20%

Example 3:

Working in a pair you have completed the PR3 ELISA and are checking the result of your positive control by interpolating the concentration in IU/ml from the optical density read out from the plate reader. You notice that your lab partner has reported the result for the positive control as >10IU/ml rather than an absolute value so ask to see their graph, which is shown below. Have they processed the positive control sample correctly and do you need to take any further action?



A	Processed incorrectly, but the positive control has a value equal to that of the high calibrator so the assay has worked	20%
B	Processed incorrectly, the student has drawn through the standard curve and reported the value for the high calibrator	50%
C	Processed correctly, the student has drawn through the standard curve and reported the value for the high calibrator	0%
D	Processed incorrectly, though the positive control is >10 so the run has passed	30%
E	Processed incorrectly, the positive control should be >80 so the run has failed.	0%

Results

Quantitatively, a notable increase in the median mark for the module was noted with more students achieving grades in the 2.1 (61-70 marks) and 1 (71-80) regions than in the two prior years (see figure 1).

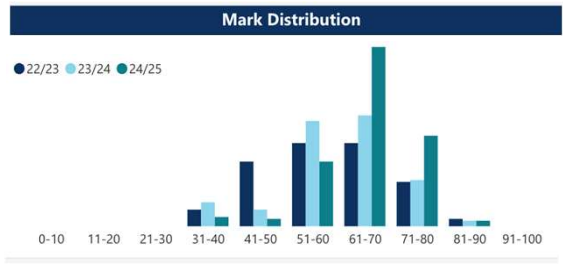


Figure 1. Mean module marks for Immunology L5 in the years 2022/23, 2023/24 and 2024/25. The situational judgement and clinical reasoning test was introduced in 24/25, replacing a combined laboratory report and online MCQ.

Qualitatively, student feedback is show in the image below. Broadly it was very well received by the students though some requested more time to read and additional practice questions (see figure 2).

Figure 2. Module feedback from students who undertook the SJT in the academic year 2024-2025. Image created in Biorender.

Discussion

The introduction of this situational judgement and visual-based assessment was associated with an overall mean grade increase of 4.37%. This improvement may reflect enhanced understanding of laboratory techniques and clinical reasoning, greater student engagement with an online format, or potentially the reduced subjectivity compared to traditional written reports.

Student feedback was highly positive; they found the assessment engaging, novel, and interesting, and appreciated the connection between laboratory results and clinical scenarios. Based on external examiners recommendation, we will also trial in-person version of this assessment in 2026

While these results are encouraging, a fuller understanding of the impact on learning requires qualitative exploration, such as focus groups, to assess whether the assessment promotes deeper conceptual understanding and long-term skill development, most notably from students returning from NHS placements.

References

University of Lincoln (a) (2025) Module marks summary dashboard – undergraduate module BGY2002 [Anonymised Report].

University of Lincoln (b) (2025) Feedback on Module BGY2002 Immunology. Student Feedback Report. [Anonymised Report]

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