
CASE STUDY 14

Moving Away from Solely MCQ-based Exams: Short Answer Questions for Enhancing the Variety of Assessment Methods in the Large Classroom

Discipline:	Medicine
Student Numbers:	315
	Combined cohort of Stage 2 Graduate Entry Medicine and Stage IV Undergraduate Medicine Programmes



Dr Melinda Halasz

Introduction and Context

PATH30030 Haematology/Immunosuppression is a UCD level 3 (NFQ level 8) Pathology module in Medicine worth 5.0 ECTS credits. The module is designed for the combined cohort of Stage 2 Graduate Entry Medicine (GEM) and Stage 4 Undergraduate Medicine (UgM) Programmes (including a group of Malaysian students) for the maximum number of 315 students, from all over the world. The students have diverse educational, cultural and ethnic backgrounds.

This module outlines the diseases of the peripheral blood, bone marrow and lymph nodes and their treatment. It includes the principles of transfusion, the study of infective agents seen in the immunocompromised patient, helminths and infections seen in the returned traveller and their treatment. Pathology, Medical Microbiology and Pharmacology contents are delivered in this module by academic staff and clinicians.

Previously, the assessment on this module was purely multiple-choice question (MCQ) based end-of-semester examination (N=90; 100% of module grade) (Table 1). In Medicine, MCQ based examinations are favoured because they enable assessment of large amounts of content/knowledge, and it is possible to grade them by computer (and generate associated statistics) (Epstein, 2007; Table 2). The latter is especially beneficial if large numbers of students are enrolled to the programme. However, MCQs cannot assess problem-solving ability and clinical reasoning skills which medical students need to develop. In addition, students might guess the correct answer reinforcing false knowledge.

Student feedback revealed that students do not like the pure MCQ based examinations, and suggested including some element of continuous assessment, and a written part to the exit exam. The student feedback also indicated that they would learn more if there was a written part to the exam.

Therefore, to develop an inclusive assessment approach which supports Universal Design principles (CAST 2015 & 2018), I changed the assessment strategy on this module by enhancing the variety of assessment methods. Instead of a high-stakes, MCQ-only end-of-semester examination which was worth 100% of the module grade, I introduced online tutorials as continuous assessment, and clinical vignettes based short answer questions (SAQ) accompanied with images (e.g., peripheral blood smear, techniques etc) as part of the summative assessment (see Table 1).

The clinical vignettes based short-answer question worksheets developed for this module align well with the learning outcomes and relate to the teaching method on this module (Table 3). I introduced four clinical patient-related interactive review sessions where we discuss clinical patient-based problems that are similar to the SAQs on the exam, so the students are taught how to answer the SAQs ('scaffolded assessment'). These SAQs test not only factual knowledge but also clinical reasoning skills. The students are required to demonstrate that, by understanding

the underlying mechanisms of haematological disorders, they can evaluate clinical scenarios (symptoms, laboratory tests etc.) and formulate a rational approach to the diagnosis and management of the patient ('authentic assessment'). The students are informed about the expectations (i.e. depth of knowledge and skills required to solve the SAQs) in relation to the end-of-semester exam ('transparency in assessment'). The SAQ worksheets are simple and intuitive to complete; the students use the space provided in the worksheet. A small amount of writing is required from the students so the SAQs do not disadvantage students who write slowly, get tired easily ('low physical effort') or those from whom English is not their native language. Moreover, SAQs are more objective to grade than essays. In addition, it is more feasible to correct SAQs than essays in the large classroom setting.

With the new assessment strategy, my goals are to

- i utilise multiple methods of assessment ('variety in assessment');
- ii assess not only knowledge but also the problem-solving ability and clinical reasoning skills of our medical students; therefore,
- iii measure learning outcomes which are relevant to clinical practice ('authentic assessment'); and
- iv overall, improve constructive alignment.

Design and implementation of the initiative

The new assessment strategy is outlined in Table 1; it incorporates a continuous assessment component; and as part of the exit exam, students need to complete clinical vignettes based SAQ worksheets in addition to the MCQ paper. The assessment strategy is clearly communicated to the students on multiple occasions throughout the semester (introductory lecture, formative assessment session & examination review session) and on Virtual Learning Environment (VLE) Blackboard ('transparency in assessment').

"Old" Assessment Strategy	End-of-semester Exam	Clinical vignette style MCQ (N=90; Single best answer)	100%
	Continuous Assessment	Completion of five online BMJ tutorials: Anaemia in old age: common presentations (2h) Chronic lymphocytic leukaemia (1h) Hospital presentations: bruising and spontaneous bleeding (1h) HIV infection: diagnostic picture tests (1h) Dengue fever (1h)	10%
New Assessment Strategy	End-of-semester Exam	Clinical vignette style MCQ (N=50; Single best answer)	45%
		Clinical vignette based short answer questions (N=10)	45%

Table 1. Assessment strategy for Haematology/Immunosuppression

Continuous assessment. Students are requested to complete five online tutorials during the semester. This is worth of 10% of their final grade. The tutorials are available on the British Medical Journal Learning website (<https://learning.bmj.com/>). BMJ Learning is a medical education resource not only for students but also for doctors and other healthcare professionals. Students are provided with clear instructions on how to access BMJ Learning (in class and on Blackboard). I cherry-picked five online modules that complement the lectures and they are in line with the learning objectives of this module. In total, the five online tutorials take about 6 hours to complete. The students can complete this task any time during the semester, providing an opportunity to self-regulate their learning. These tutorials are in line with the module content, and students are guided when to attempt the different tutorials. Students are asked to submit their Certificates of Completion by the end of week 12.

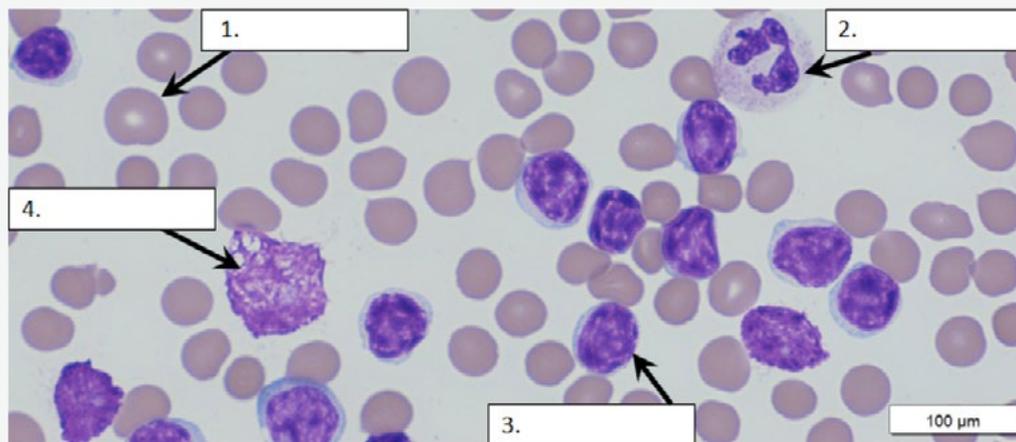
End-of-semester examination. The two-hour long exit exam is worth 90% of the final grade and has two components; an MCQ paper and clinical vignettes based SAQs. By applying different assessment methods, we can overcome the disadvantages of individual methods (Epstein, 2007; Table 2). In addition, this provides multiple opportunities to succeed and demonstrate learning.

Method	Advantages	Disadvantages
MCQ	<ul style="list-style-type: none"> Assess application of knowledge in a clinical setting ('clinical vignette') Assess knowledge of large content areas in short time Can be graded by computer & item analysis can be generated Reliability of marking 	<ul style="list-style-type: none"> Does not assess problem solving ability and clinical reasoning skills Difficult to write good questions Can result in cueing Incorrect answers might influence subsequent false knowledge
SAQ	<ul style="list-style-type: none"> Assess problem solving ability and clinical reasoning skills (e.g. interpretation of histopathological images and lab tests etc.) Avoid cueing 	<ul style="list-style-type: none"> Reliability depends on the grader à Model answers to be provided Time consuming to grade for large numbers of students

Table 2. Advantages and disadvantages of clinical vignettes based MCQs and SAQs

The clinical vignettes style MCQs consisting of a clinical problem ('stem') and 5 options (1 best answer and 4 distractors) allow us to assess knowledge, comprehension and application of knowledge in the clinical setting (Collins, 2006). There are at least two MCQs from each lecture, which are also relevant to the learning outcomes.

In addition to the MCQ paper, students need to fill in ten clinical case-based SAQs (5 Haematopathology & 5 Medical Microbiology questions) which are suitable for assessing problem-solving ability and clinical reasoning skills. The SAQs also build on a clinical scenario, a patient-related case. The students are also provided with accompanying laboratory tests and a histopathological image (e.g., peripheral blood smear, bone marrow biopsy, etc.). There are a few questions associated with each case which can be answered by a few words or at most one sentence (Figure 1). Questions are related to setting up a diagnosis and deciding on patient management. The students need to synthesize the information learnt from the patient's presentation, laboratory results and accompanying images to answer the questions ('authentic assessment'). The use of case-based SAQs are in clear alignment with the learning outcomes and teaching methods (case-based review sessions, tutorials) (Table 3); and solving these problems require higher order thinking.



A 61-year-old man with a history of diabetes mellitus and hypertension visits his GP to adjust his medications. Results of his lab tests are shown below:

- WBC: 75,000/ul with 90% mature lymphocytes and 10% neutrophils
- Haemoglobin: 14.5 g/dL Haematocrit: 47%
- Platelet count: 244,000

His peripheral blood smear is shown on the right.

- a Identify the cells (1-4.) on the peripheral blood smear. (2 mark)
- b Evaluate the patients lab results and peripheral blood smear. What are the hematologic abnormalities present here? _____ (2 mark)
- c What is the most likely diagnosis? Which test would you order to confirm the diagnosis? _____ (2 mark)
- d What would be the treatment of choice for this patient at this stage? (1 mark)

- e What complications would you expect during the course of the disease? (3 mark)

Figure 1. An example clinical vignette based short answer question worksheet. (Image courtesy of Dr Mark Coyne.)

Despite having a written component, students are not required to write extensively, SAQs can be answered by only a few words ('low physical effort'). Since the students need to fill in the SAQ worksheets, the space provided is a guidance for the length of the expected answer. In addition, the marks associated with each question are also indicated on the worksheet ('transparency in assessment').

Formative assessment. A formative assessment session is scheduled for week 7. This is a golden opportunity for the students to test their knowledge and self-evaluate their readiness for the exam, since its format is the same as the end-of-semester exam ('transparency in assessment').

Teaching methods supporting higher order thinking. In addition to the lectures, students have four interactive clinical case-based sessions, tutorials, an examination review session and an additional review session on interpreting peripheral blood smears and diagnostic tests. All these teaching modalities aid to improve their clinical reasoning skills and problem-solving ability; therefore, facilitate their preparation for the SAQ component of the exam and their clinical years ('scaffolded assessment').

Learning Outcomes On successful completion of the Haematology and Immunosuppression Module students should have:	Taught? (Y/N)	How?	Assessed? (Y/N)	How?	Relevance to Clinical Practice (+ / ++ / +++)
<p>1. Improved their biomedical knowledge by being able to:</p> <ul style="list-style-type: none"> — Describe the mechanisms causing anaemia; — Classify the haematologic malignancies, describe their natural histories and their effects on patients; — Describe the mechanisms underlying disorders of bleeding and clotting; — Describe the infections seen in the immunosuppressed patient and in patients who have recently travelled abroad; — Classify and describe the behaviour of common pathogenic helminths; — Outline the principles of transfusion of blood and blood products. 	Y	Lectures Tutorials Case-based review sessions	Y	BMJ MCQ SAQ	+++
<p>2. Improved their clinical skills by being able to:</p> <ul style="list-style-type: none"> — Formulate a logical approach to diagnosing the cause of anaemia and apply this to the selection of appropriate treatments; — Explain and discuss the approach to treatment of haematologic malignancies and the agents used in their treatment; — Formulate a rational approach to the diagnosis and treatment of disorders of bleeding and clotting; — Formulate an approach to the diagnosis and treatment of infections seen in the immunosuppressed patient and in patients who have recently travelled abroad, and to infection with common pathogenic helminths. 	Y	Tutorials Case-based review sessions Multidisciplinary Team Meeting	Y	SAQ	+++
<p>3. Improved their Professional and Personal skills by:</p> <ul style="list-style-type: none"> — Participating in group-based interactive tutorials; — Assimilating the professional approach that Haematologists, Medical Microbiologists and Infectious Disease Specialists demonstrate in their clinical illustrations in lectures and case-based tutorials. 	Y	Multidisciplinary Team Meeting Case-based review sessions Tutorials Lectures	Y	BMJ SAQ	+++

Table 3. Outcome practice mapping for the Haematology/Immunosuppression module. (BMJ: BMJ Learning online tutorials)

Results/Finding/Feedback

Introducing the new inclusive assessment strategy resulted in improved constructive alignment (Table 3), and improved student feedback (Figure 2). The students found the assessment methods relevant to the course work (4.37 out of 5); they felt they achieved the learning outcomes on this module (4.27 out of 5); and have better understanding of the subject (4.44 out of 5).

Continuous assessment. The students liked 'having some continuous assessment' because 'it helps take the full pressure off at end of semester.' According to the students: 'The BMJ tutorials is by far the best continuous assessment. The overall GEM course is very heavy but this type of assessment actually contributed to learning. I'm still rereading them as study aids.' The students found the BMJ online tutorials helpful and enjoyable. 24% of the students who completed the survey named BMJs as one of three aspects of the module that most helped their learning. According to the students: 'I thought the BMJ's were a great way of navigating the course material in a clinical context.' 'BMJs were a good revision tool after completing a section of lectures.' 'Thought the BMJs were a great learning tool and I felt that I learned a lot from completing them.' Many students completed additional BMJ tutorials (beyond the five compulsory ones) relevant to the course content.

End-of-semester examination. Most students considered the exam fair; 'It was very clearly communicated what was necessary in terms of exam preparation (maybe almost too much, though in a busy semester this is surely appreciated). In any case, the exam was very fair, no bad surprises.' The new exam format clearly promotes the students' critical thinking and requires a deeper understanding of the content. 'I thought the exam layout was very good, it was different to any format we have had to date but I felt it tested understanding of the subject better than most other modules.'

Many students liked the SAQ format; 'Section 2 of the paper (short questions with pictures) was much preferable to case studies and I'd recommend this format continues' and they felt that SAQs are 'a lot better than having to do long essays'. However, few students indicated in their feedback that the exam was too difficult and too much for two hours.

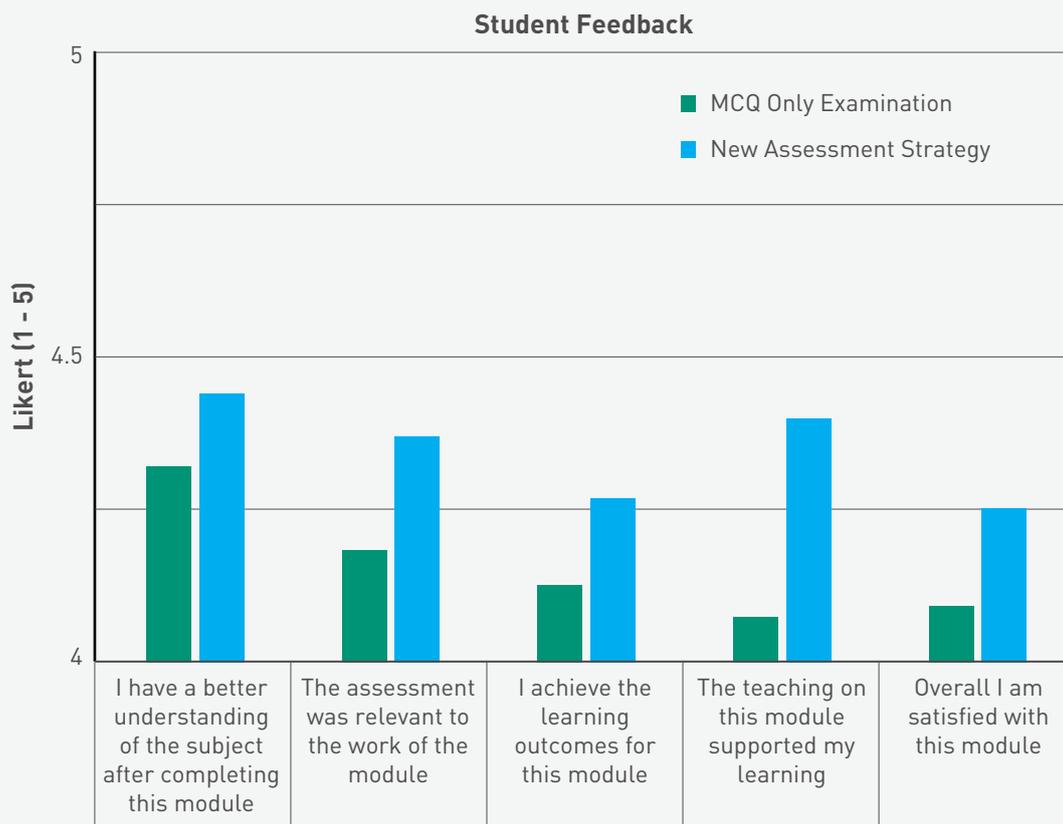


Figure 2. Improved student feedback on the module after introducing the new assessment strategy. (Response rates: 24% and 26%, respectively.)

Teaching methods. According to the students: ‘The extra teaching sessions, formative assessments and exam preparation sessions she provides all play a role in ensuring that the needs of every student are met while being both challenged and encouraged’.

More than half of the students who completed the survey appraised the interactive case-based review sessions:

‘The review lectures for the haematology portion of the module after each lecture was a fantastic idea. Going through cases after we learned the material was a fantastic way to consolidate the concepts that had been taught in lectures.’

‘The case review sessions were amazing and really helped prepare for the exam and made it easy to keep up with material.’

'Review lectures were really good - we were always armed with the ability to know what we were supposed to learn. Though the amount of content was large these allowed us to digest the information better as we were given more time to think about scenarios. The module was also really well run with the perfect balance between BMJs, tutorials and review lectures.'

'The 4 review lectures with cases to review the material covered in the haematology section of the module were so helpful: the material in this portion of the module was quite overwhelming so the case lectures were crucial and really helped me understand the material.'

'I very much enjoyed the Review cases, they reinforced the learnt content and put the material in a clinical context. It is very obvious that you care a lot that students understand the material.'

'The review lectures were excellent and really helped to make the content of the module clinically relevant.'

Grade distribution. Thanks to the new assessment strategy, the grade distribution is much better than in previous years, it follows a Gaussian distribution (Figure 3). Earlier, almost half of the class received a shade of A (MCQ only exam) resulting in skewed grade distribution. The new assessment strategy, introducing the clinical vignette based SAQs, helped to better identify the excellent students. Majority of the class received Bs (32%), and 6% of the class failed the exit paper. Interestingly, about two third of students with failing grades did not attend the Haematology tutorials.

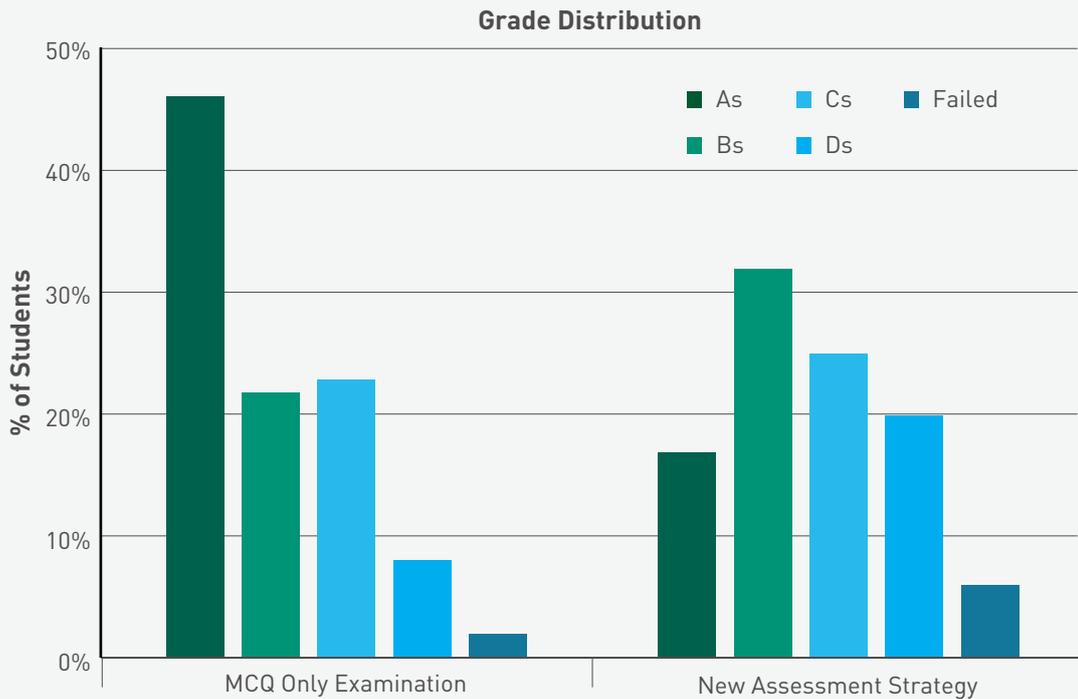


Figure 3. Improved grade distribution after introducing the new assessment strategy.

Overall satisfaction. Overall, the students are extremely satisfied with the module as it is apparent from their feedback:

‘The lecture content and structure was really well thought out, which greatly helped me in understanding haematology. The review sessions were excellent for consolidating the learning to date and added appropriate additional information that was of interest. The tutorials for the haematology part of the module were very good, with enough cases to cover each major topic. Overall, an excellent, well-organised module with very relevant teaching throughout and a fair end-of-semester examination.’

‘This module was fantastic. The teaching was superb from every angle.’

‘I actually thought the module was pitched perfectly- I really enjoyed the module and felt the way it was delivered helped me to understand the material! I also thought the BMJ continuous assessment was really appreciated- it encouraged us to do some extra reading around this material to consolidate our understanding, and also took the pressure off a little bit for the end of semester exam.’

'I really enjoyed this module. The content was challenging but every single method of helping us understand the topic was done. There were tutorials, review lectures, overview lectures. I immensely enjoyed this module because I had the material to understand it. There are absolutely no negatives to give in this module. If this module could be used as a model module, I would use it! Amazing.'

'I think the entire haematology portion of the module was great I would not change a thing.'

Advice to others for implementation

The clinical vignettes based SAQs could be utilised in other modules in Medicine (either to enhance the variety of assessment methods or to replace existing essays) because this format assesses not only knowledge but also the problem-solving ability and clinical reasoning skills of medical students. Patient-related scenarios can be tailored to the learning outcomes of the specific module. Real life based SAQs could also be developed in other disciplines.

If you are considering implementing clinical vignettes (or real life) based SAQs in your module, I would recommend that you:

- i** clearly communicate your expectations to the students (in Medicine this means that students are informed upfront if they are required to interpret histopathological images or laboratory tests as part of the exam);
- ii** tailor the teaching modalities on your module accordingly, so that you prepare the students for the new exam format;
- iii** include opportunities to evaluate clinical scenarios/real life examples throughout the semester;
- iv** include a formative assessment session with a structure similar to the format of the exit exam.

References & Resources

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