

Assessment as Learning in Medical Education: Feasibility and Perceived Impact of Student-Generated Formative Assessments

Ritu Lakhtakia (✉ ritu.lakhtakia@mbru.ac.ae)

Mohammed Bin Rashid University of Medicine and Health Sciences

Farah Otaki

Mohammed Bin Rashid University of Medicine and Health Sciences

Nabil Zary

Mohammed Bin Rashid University of Medicine and Health Sciences

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Assessment as Learning in Medical Education: Feasibility and perceived impact of student-generated formative assessments

Ritu Lakhtakia^{1*}, Farah Otaki², Nabil Zary³

¹College of Medicine, Mohammed Bin Rashid University of Medicine and Health Sciences,
Dubai, United Arab Emirates.

²Strategy and Institutional Excellence, Mohammed Bin Rashid University of Medicine and
Health Sciences, Dubai, United Arab Emirates.

³Institute for Excellence in Health Professions Education, Mohammed Bin Rashid University
of Medicine and Health Sciences, Dubai, United Arab Emirates.

*Corresponding Author

Professor Ritu Lakhtakia

e-mail ritu.lakhtakia@mbru.ac.ae

Abstract:

Background

Self-directed learning is a vital competency, desirable to sustain lifelong competencies in health professions education. Contemporary education practices emphasize this aspect of undergraduate medical education through innovative designs of teaching and learning like the flipped classroom and team-based learning. Assessment *as* learning can be a unique way to inculcate active learning habits. It charges the student to create formative assessments, reinforcing student-centred deep learning, and critical thinking. This study aims to explore, from a learner perspective, the feasibility and perceived learning impact of student generated formative assessments.

Methods

The study design employed an educational intervention on a cohort of students in the second year of a six-year undergraduate medical program. The study design involved engaging students' in generating assessments using peer-collaboration, tutor facilitation, and feedback as part of a single course curriculum delivery. The exercise was followed by a mixed methods accrual of student perceptions through surveys. Quantitative survey data was analysed on SPSS. Qualitative inputs underwent thematic analysis.

Results

Students' overall score of satisfaction with the educational intervention was 84%. On quantitative analysis, this was strongly correlated with scores for ease and impact on a 5-point Likert scale. The

themes that emerged from the qualitative analysis, included: prominent characteristics, immediate gains, and expected long-term benefits of their engagement in preparing the formative assessment. Within the characteristics theme, the following categories emerged: individuals' engagement, effective interdependencies, novelty, and time requirement. The identified immediate gains included increased motivation, and acquisition of knowledge and skills. As for the expected long-term benefits, they included critical thinking and problem solving, and clinical reasoning.

Conclusions

As a form of assessment associated learning, student-generated assessments are perceived as viable and constructive, and a stimulating educational exercise by the student-authors. In the short term, the activity constituted for the students a fun, challenging opportunity to deep dive into the content, be creative in designing questions, and improve exam-taking skills. Students expected the long-term effects to include enhancement of critical thinking, and inculcation of student-centred attributes of lifelong learning and peer collaboration, vital to the practice of medicine.

Keywords

Self-directed learning; Assessment as learning; Student-generated assessments; Life-long learning;

Medical Education

Background

Self-Directed learning is a desirable student attribute that inculcates the habit of lifelong learning, invaluable to a budding health professional (1). Adult learning theories in medical education point to the significance of student-learners taking charge of their learning through successive phases of dissonance, refinement, organisation, and feedback anchored by a learner-tutor nexus (2). Several teaching and learning activities can encourage the development of this quality. Flipped learning classrooms, simulation-based sessions with student-centred activities, and Team-Based Learning are a few examples. They promote higher level cognition (application, analysis, evaluation, and synthesis of knowledge), and are perceived by students as beneficial to learning (3).

Relatively less attention has been paid to developing active learning in undergraduate medical education through adopting learning techniques centred on assessment (Harris, 2015). Feedback on formative and summative assessments aims to bridge identified learning gaps but remains a passive process; its success dependant on student follow-through. Best practice in assessment recommends that beyond assessment *of* learning (AoL), which is summative and determines achievement of outcomes, assessment *for* learning (AfL) through formative feedback and assessment *as* learning (AaL), which is learner-centric, are vital to enable cognitive and skill reinforcement (4).

Student-generated assessments aim to encourage deep reading and demonstration of improved learning by creating questions that test higher-order thinking, hence challenging students' integration of disciplinary knowledge. The students can benefit through improved exam-preparedness and performance by expanding a pool of formative questions (5), (6). The exercise can have other benefits, including collaborative work through peer engagement and receiving constructive criticism (7). While the intention to enhance student engagement and reinforce learning abilities and styles through assessment is desirable, it is also essential to hear the student voice by exploring their perceptions of such an educational intervention.

This study aims to explore, from learners' perspective, the feasibility and perceived learning impact of student generated formative assessment.

Accordingly, the research questions of this study are:

- How do the students evaluate the ease of contributing to the development of formative assessment?
- How do the students perceive the impact of creating formative assessment items on their learning experience?
- What is the association between perceived ease of contribution and impact of learning?

Methods

Research Design

This study relied on a cross-sectional design. The tailor-made survey questionnaire was assembled to capture quantitative and qualitative data on undergraduate medical students' perceptions concerning their engagement in developing formative assessments. This unique educational intervention of student-centred assessment (i.e., assessment *as learning*) was implemented in a required three-credit course entitled: Pathologic Basis of Disease. The triangulation of data types (i.e., qualitative and quantitative) was meant to raise the study's robustness and the validity of the generated findings. The study's ethical approval was granted by the MBRU, Institutional Review Board (Reference # MBRU-IRB-2019-026).

Context of the Study and Participants

This study was undertaken at the Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU), Dubai, United Arab Emirates. The study cohort was the second-year students [Academic Year (AY) 2019-2020] of a six-year medical undergraduate program (MBBS). The cohort was constituted of fifty-four (n=54) medical students.

Description of the Intervention

The course under investigation was the medical students' first introduction to Pathology. In the first six weeks of the semester, the students were provided with weekly formative assessments generated by the tutor, followed by feedback sessions to reflect upon identified points of strengths and weaknesses. An in-course summative assessment (weightage 40%) was administered mid-semester in Week-8. The students generated formative assessments in Multiple Choice Questions (MCQ) format between weeks 9-14. The end-semester summative assessment (weightage 60%) was held in week 16 (Figure 1).

Figure 1. Study Overview

Students were first guided in the principles of MCQ construction. Nine groups, of six students each, created one MCQ per week on the ongoing week's teaching objectives. The resultant 9 MCQs were discussed the following week at an allotted time, supplemented by tutor-generated questions. One representative per group presented their MCQ and invited critical, constructive peer comments. The tutor moderated the discussion and provided feedback on construct and content (Figure 2).

Figure 2. The educational intervention: assessment *as* learning

Data Collection

The data was collected using a survey that was designed specifically for this study (Table 1). The survey was composed of two segments. The first segment is a Likert scale of five points (1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, and 5: Strongly Agree) across ten components, all of which were mandatory to respond to. Components 1 through 5 were meant to evaluate the Ease of Contributing to the Development of Formative Assessments. As for components 6 through 10, they were designed to capture the students' perception of the Impact of Contributing to the Development of Formative Assessments. The participants were given the option to elaborate on their responses to each of the components.

Table 1 The components of the quantitative segment of the tool adapted for this study

Ease of Contributing to the Development of Formative Assessments
1. The exercise was fairly simple.
2. The exercise enabled me to become more competent at developing questions.
3. Effectively undergoing the exercise required that I get out of my comfort zone.
4. I am willing to repeat this exercise for other courses.
5. Contributing to the creation of formative assessments adds value to learning experience.
Impact of Contributing to the Development of Formative Assessments
6. The exercise raised my capacity to understand the respective course material.
7. Developing questions improved my knowledge of the subject matter.
8. The exercise developed my critical thinking.
9. The exercise raised my capacity to effectively answer relevant questions.
10. In of themselves, the exercise and the generated in-class feedback and reflections on the created questions improved my capacity to associate the respective basic science concepts with their medical application (i.e., clinical correlation).

The participants were given the option of qualitatively elaborating on their responses to each of the ten components. The second section entailed an open-ended question that was meant to solicit any additional reflective qualitative data using the following open-ended question: "Do you have any further remarks on your engagement with developing formative assessments? If so, please indicate them below:"

The generated data collection tool underwent content and face validity checks, by the members of the team who developed and reviewed it. This team is constituted of the coordinator of the respective course, the chairperson of the CoM Student Assessment and Progression committee, an expert in Medical Education, and a staff member of the unit which handles the university's Quality Assurance and Institutional Effectiveness portfolio.

The participation in this data collection initiative was completely voluntary. The privacy and the data confidentiality of the students were protected, and no personal identifiers were recorded. The survey was assembled throughout May 2020. Each of the study participants were given a unique identification number.

Data Analysis

Quantitative Analyses

The quantitative data was analysed using SPSS for Windows version 25.0. For each of the 10 quantitative components, the mean and standard deviation were calculated. An overall score of satisfaction for all components was computed, along with an independent score for each of the two segments of the tool: Ease and Impact. For all three scores, the mean and standard deviation were calculated, as well.

Since the scale used for capturing the perception of the participants was tailor-made for this study, the validity tests of Cronbach's Alpha and the Principal Component Analysis (PCA) were performed to check the internal consistency and external variance, respectively, of the adapted tool.

To select appropriate means of correlating the variables, a test of normality was conducted for each of the 10 components, and for the three scores: overall, and ease and impact. The data of each of the 10 components and the ease and impact scores were not normally distributed ($p < 0.01$). As for that of the overall score of satisfaction, it was normally distributed ($p = 0.375$). Accordingly, a matrix of bivariate correlations was developed using Spearman test to assess the extent to which the three scores relate to each other and to their components.

Qualitative Analysis

The qualitative data analysis started after the conclusion of the data collection phase. The data were analysed using thematic analysis by two researchers (RL and FO). Prominent patterns were identified after examination of the dataset.

Results

Quantitative Analyses

Out of the 54 students, 27 responded (i.e., response rate= 50%). The reliability score of Cronbach's Alpha for the tailor-made evaluation tool that captured the students' perception (i.e., ten components) was 83.6%. The percentage of the total average of the overall score of satisfaction was 84%, somewhere between "Agree" and "Strongly Agree", as per Table 2.

Table 2 Output of descriptive quantitative analysis

Identification Number of Component of Satisfaction	Mean (SD)	Percentage of the Mean	Category
1	4.19(0.736)	83.8%	A-SA
2	4.22(0.641)	84.4%	A-SA
3	3.41(1.083)	68.2%	N-A
4	4.04(1.055)	80.8%	A
5	4.52(0.643)	90.4%	A-SA
6	4.56(0.577)	91.2%	A-SA
7	4.33(0.679)	86.6%	A-SA
8	4.19(0.736)	83.8%	A-SA
9	4.30(0.724)	86%	A-SA
10	4.26(0.813)	85.2%	A-SA
Score of Ease*	15.85(2.231)	79.3%	A
Score of Impact#	26.15(3.45)	87.2%	A-SA
Overall Score of Satisfaction	42(4.907)	84%	A-SA

N= Neutral, A= Agree, SA= Strongly Agree

*Score of Ease covers components 1 to 4; #Score of Impact covers components 5 to10

According to the PCA, 75.2% of the variance across the ten components can be explained by the instrument, which means the instrument is reliable and valid to measure what it is intended to measure ($p < 0.01$).

Correlational/ Inferential

As illustrated in Table 3, the overall score of satisfaction is significantly influenced by the perception of the students regarding all components except for component 3: "Effectively undergoing the exercise required that I get out of my comfort zone" ($p < 0.01$). Moreover, all three scores, overall, and ease and impact turned to be correlated to each other ($p < 0.05$).

Table 3. Matrix of bivariate correlations

1	2	3	4	5	6	7	8	9	10	Score		
1	.443	-.234	.622	.315	.125	.423	.382	.442	.344	.592	1	Coefficient
	.021	.241	.001	.110	.534	.028	.049	.021	.079	.001		Sig.
	1	.033	.330	.293	.208	.480	.475	.531	.387	.658	2	Coefficient
		.871	.093	.139	.298	.011	.012	.004	.046	.000		Sig.
		1	.106	-.128	.050	-.082	.118	.007	.019	.217	3	Coefficient
			.599	.524	.805	.686	.558	.973	.927	.278		Sig.
			1	.268	.122	.478	.402	.300	.364	.629	4	Coefficient
				.176	.544	.012	.037	.128	.062	.000		Sig.
				1	.567	.578	.652	.410	.712	.638	5	Coefficient
					.002	.002	.000	.034	.000	.000		Sig.
					1	.706	.634	.485	.603	.596	6	Coefficient
						.000	.000	.010	.001	.001		Sig.
						1	.735	.595	.630	.813	7	Coefficient
							.000	.001	.000	.000		Sig.
							1	.625	.764	.852	8	Coefficient
								.000	.000	.000		Sig.
								1	.674	.746	9	Coefficient
									.000	.000		Sig.
									1	.783	10	Coefficient
										.000		Sig.

(Bold text indicates correlations that revealed significance (Sig), as defined by the p-value)

Qualitative Analyses

The analysis of the qualitative data capturing the students' perception resulted in three interrelated themes, namely: prominent characteristics, immediate gains, and expected long-term benefits of their engagement in preparing the formative assessment (Figure 3).

Figure 3. The study's conceptual framework

Theme 1: Prominent characteristics

This theme included the text fragments that refer to how the students characterize the program and what stood-out to the students as the variables upon which the activity's success relies. It included variables such as immersing oneself in the experience.

23: "...it was not very easy since one needed to concentrate and focus a lot to develop MCQs..."

It was clear for the participants that they needed to form effective interdependencies with colleagues.

11: "...we needed to come up with questions related to our own learning... it was a team effort... discussing the questions, among each other, enabled us to develop a better idea as to what would constitute good distractors...the variety of perspectives was useful, of course..."

Some students highlighted that the teamwork inherent in the exercise and ensuring that all team members are equally engaged was challenging.

14: "...the same people, within our team, kept on generating the questions. Not all the team members contributed equally; some members did not provide any input... we were able to eventually address this challenge... I needed to converse more with some of my colleagues whom I do not usually have the opportunity to speak to..."

22: "...some of the group members did not bother to do their job in developing questions, which caused some frustration within the team..."

The students believed that engaging in the experience enabled them to develop the necessary insight and the mastery or proficiency of preparing formative assessments. This belief, coupled with focusing on the exercise at hand, helped them in developing self-efficacy.

03: "...we are expected to generate the MCQs soon after we learn a new concept. This required that we look-up key terms and additional information related to the respective concept. As part of preparing for the MCQs, we needed to come-up with distractors. We needed to really understand the content to be able to do the task..."

11: "...to develop the capacity to create our own MCQs and share them with other students..."

This theme also included text fragments that show that the students were aware that the experience was novel and that they had to go through a learning curve.

03: "...it was surely a new experience for me; we were given the opportunity to view the exam from the examiner point-of-view, from the perspective of the person forming the MCQs. It felt really good..."

04: "...it was fairly simple, but developing more elaborate questions was more challenging..."

08: "...it is the details that matter and that was a bit difficult, at first. Trying to discern two similar topics, while thinking of sequential order and associated elements, and formulating possible choices, among which the 'best' answer, were the steps that required extra effort..."

11: "...formative assessments allow us to test our understanding of concepts without the burden of having to perform well in terms of a test or a grade which gives us more opportunities to make mistakes and to learn from them..."

19: "...I am not familiar with such exercise so I was getting out of my comfort zone, but I would say, in a positive way..."

The students also highlighted how the exercise required time investment.

23: "...however, since we were given enough time to do it, it was good..."

Theme 2: Immediate gains

This theme encapsulated all the text fragments that refer to what the students gained upon completing the experience. In general, most of the students expressed excitement and were happy to have gone through this experience.

03: "...finding sensible, reliable distractors became a 'hobby' when forming MCQs... It was a valuable experience, and a good exercise. Plus, it was fun..."

15: "...it was an interesting and helpful exercise..."

It was evident to the students that they had gained ample knowledge and skills from the experience.

27: "...it was both beneficial for our learning and interesting for us since we got to see how much work it actually takes to formulate proper questions... It was a very useful and interesting task..."

The students referred to the learning that occurred in relation to the core subject (i.e., pathology).

03: "...this exercise enabled us to effectively learn the core concepts of pathology..."

08: "...it allowed for additional practice on the learning material..."

14: "...this exercise covered some parts that I might have missed or did not fully comprehend, at first..."

20: "...in order to structure a question, I had to gain good understanding of the topics, so it was really helpful..."

Enhancing the knowledge and skills around assessment taking was also apparent to the students.

08: "...we were required to prepare a test-like question from the preceding week's material... we learned about the types of questions and of possible answers that are commonly used which enabled me to approach the course material in a different role..."

14: "...it really enhanced how I tackle questions and how I think when answering questions..."

15: "...we got to understand how the examiner thinks; this is a good skill that is useful for us to have when revising the required content prior taking any one exam..."

Theme 3: Long-term benefits

This theme includes text fragments that refer to the gains that the students expect to materialize, over time, from this experience (e.g., critical thinking and clinical reasoning).

08: "...this process gave me the opportunity to change my learning style... to create a question, one needs to approach the topic differently; this reinforces one's understanding of the topic and equips the students with transferable skills..."

14: "...pathology clinical are really essential and shade huge light on the grey area that connect the aetiology/pathology to clinical manifestation..."

24: "...I learned how to figure-out what to focus on, what the important parts of any lecture is... I think it was great; it gave us insight as to what the actual assessment will be like and helped prepare us for the In-Course Assessment..."

27: "my question writing skills, which require ample of critical thinking and problem-solving skills, improved since I had to formulate questions that were advanced... this all was so beneficial to my learning..."

Discussion

This study sheds light on how, from a constructivist perspective, assessment can be leveraged to drive students' learning. Constructivism implies the learners' central role in taking charge of their learning, having insight into learning gaps, and developing ways to improve learning. Assessment *for* Learning (AfL) can be a significant component of this self-regulatory mechanism but often relies on feedback after formative assessments that remain tutor-driven, focused, and directive. However, in assessment *as* learning (AaL), the student assumes control by dominating the learning process's discourse, and producing a self-regulatory and self-productive identity (4). Students set goals, monitor progress, and reflect on learning prospectively, not retrospectively, as in formative assessments.

In the current study, students' perception of AaL implemented in a course of an MBBS program proved rewarding. Students' qualitative reflections on undertaking assessment creation were characterised in terms of short- and long-term gains in this study. Students' scores on overall satisfaction of engagement with designing assessment, and its ease and impact were all considerably high with significant correlation among all three scores. Similarly, in a previously assembled survey inquiring about a medical student-generated question bank, in the University of Manitoba, Canada, 91% of students reported satisfaction with their engagement in developing questions (7).

The quantitative results of this study showed that the only component that was not statistically associated with the students' overall satisfaction with the experience was that the exercise required them to go out of their comfort zone. The qualitative inputs showed that the experienced unease was favourably perceived as an enabling challenge along the same line. The idea that going out of one's comfort zone can be of added value is well established in the literature (8). In a US dental undergraduate program, a study on student-generated MCQ items reported that the students were able to prepare a higher cognitive level of questions compared to the instructor (9). Students perceived the intervention as

contributing to their learning. Thus, student creation of assessments provides a unique opportunity for the learner within a developmental framework of assessment (10).

In the current study, students specifically expressed their realisation of the added value of assessment-enhanced learning towards the core content of the specific course. According to the students, this is happening when tasked with preparing questions by increasing focus on the subject matter and by the requirement of viewing it from a different perspective. They were surprised how their effort to create questions contributed to exam preparedness and insight into the examiner's viewpoint. One could extrapolate that this would reduce the stress of exam preparation at the end of the semester. The development of higher-order thinking is best achieved through inquiry and investigation, applying knowledge to new situations and problems, producing ideas and solutions, and collaborative problem-solving (11).

The high level of satisfaction reported upon in our study was related to the students' perception of the value of learning. This, in turn, encouraged students to invest time and effort, positively reinforcing the link to the perceived learning impact of the exercise. Students commented that creating questions on a weekly basis promoted a regularity in reading, reflecting, and revising habits. The literature on the subject matter indicates contradictory findings. In a study on undergraduate student generated MCQs in a 4th year Pathology course of a New Zealand medical school, students could create cognitively challenging MCQs. Still, they did not find the task of educational value (12). The students were engaged well with the Peer-wise platform for question creation but did not offer good peer feedback. On the other hand, in another study involving second year biomedical sciences students (n=107), perceptions of student-authored assessments in a Biochemistry course demonstrated eagerness and generation of a large repository of relevant, good quality MCQs (13).

An example of student generated formative assessments, specifically targeting competency-based progression, is illustrated by a multicentre pilot study in German medical schools (14). A core team of 17 students from third to ninth semesters drawn from 17 universities were trained on MCQ generation and review, contributing 118 MCQs to a 144-item assessment based on a pre-agreed competency blueprint. It was administered to 469 students from

eight medical schools. The items were of high quality with higher order thinking and generated high test reliability. However, student authors seemed to favour item-generation on theoretical and practical skill competencies over scientific and communication skills competencies. The examinees perceived it more as an opportunity for feedback rather than a learning experience.

Another unexpected but beneficial aspect highlighted by students is the perceived "gamification effect" of the exercise. During moments of relaxation tossing around distractors became second habit to them, as an intellectually entertaining tool. According to Gray, creativity is the basis of critical thinking and it always involves a degree of playfulness: "the critical thinker plays with ideas...to see what happens and to explore consequences" (15). The development of such instinctive and enjoyable learning through play can have a long-lasting impact, sustaining self-learning, and building peer-learning habits (16). However, there were instances of dissatisfaction when a team member did not actively participate and substantially contribute to question creation, which reflected adversely on team output. There are contradictory findings on peer collaboration from other studies: in one study, team cooperation towards item generation was perceived as unsatisfactory (9), while in another, willingness to collaborate with peers was agreed to by 86% of students (7). During the ongoing COVID-19 pandemic, the rapid transition to distance learning provided the impetus to students from Queen's University Belfast to create and share MCQs through Instagram to mutually enhance their learning (17). Thus, it is established that beneficial outcomes are resulting from assessment-based peer-assisted learning.

Some students in this study perceived that the quality of generated questions was inconsistent. They reported that some of their peers produced questions of low cognitive levels. In contrary, in another study from a medical school in Cardiff, students were engaged in creating a question bank duly mentored and vetted by content faculty. Within a three-month period, 2800 tests had been attempted, indicating the popularity of usage of this learner resource (5). The students who authored the MCQs in the Cardiff study were in their final year, which may have accounted for the higher quality of generated questions.

The statistical reliability and validity of the survey tool provide a solid anchor for the results. A follow-up exercise based upon the same framework on successive cohorts will further

reinforce the tool's reproducibility and the findings' consistency and generalizability. Investigating the effectiveness of such an intervention can be done by comparing the pre/post student performance scores. In one study, the follow-up scores on single-best answer summative exams correlated well, while performance on clinical exams did not (6).

It is worth noting that the participating students were at an early stage of their medical school journey, which might have influenced their perceptions of the value of self-learning through assessment. It would be interesting to investigate in future studies if the stage of learning is playing a moderating effect on the students understanding and perception of the exercise and its impact. Future research could use additional question formats beyond MCQs to enable student insights into their learning techniques. The study is limited in its application to a single course of one cohort of students. Hence, the generalizability of the findings is limited. The external validity of the study can be increased through an inter-cohort comparison and use of multiple item formats.

Conclusion

Student-generated assessments, as a form of AaL, are perceived as a viable, constructive, and stimulating educational exercise by the student-authors. In the short term, the exercise constituted for the students a fun, challenging opportunity to deep dive into content, be creative in designing questions, and improve exam-taking skills. Students expect the long-term effects to include enhancement of critical thinking and inculcation of student-centred attributes of lifelong learning and peer collaboration, all of which are vital to the practice of medicine.

Figures: Titles and Legends

Figure 1. Study Overview

Legend: Tutor-driven formative assessments in the first half of the semester were followed by a mid-semester, in-course summative assessment. Student-generated formative assessments in the second half of the semester were followed by a final summative assessment of the course.

Figure 2. The educational intervention: assessment *as* learning

Legend: The educational intervention comprised weekly student-generated multiple-choice questions, created through peer collaboration, supplemented by peer-critique and review, tutor moderation and feedback.

Figure 3. The study's conceptual framework

Legend: *Prominent characteristics* emerged from students' perceptions of self-generated formative assessments demonstrating *Immediate gains* and *Expected long-term benefits* and validating the educational intervention's utility towards Assessment as learning (AaL).

List of abbreviations

AY- Academic Year

AoL - Assessment of Learning

AfL - Assessment for Learning

AaL - Assessment as Learning

MCQ - Multiple Choice Question

PCA - Principal Component Analysis

Declarations

Ethics approval and consent to participate

The study's ethical approval was granted by the MBRU, Institutional Review Board (Reference # MBRU-IRB-2019-026). Informed consent was obtained from all participants. All methods were carried out in accordance with relevant guidelines and regulations.

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Consent for publication

Not applicable as there are no individual details, images, or videos

Availability of data and materials

Data collected in this study is included in the published article and available with the corresponding author

Competing interests

The authors declare that they have no competing interests

Funding

This is an unfunded study

Authors contributions

RL conceptualised, designed, executed the educational intervention, interpreted, and discussed the findings. FO designed and conducted the surveys, analysed the quantitative and qualitative data, and participated in manuscript preparation. NZ critically reviewed all components of the study, anchored manuscript review and contributed illustrations.

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Authors' information

RL is a Professor of Pathology and Chair of Student Assessment and Progression at the College of Medicine, engaged in conceiving and implementing innovative ways to improve the student learning and assessment experience.

FO is a Senior Specialist in the Strategy and Institutional Excellence department, which handles the University's Quality Assurance and Institutional Effectiveness portfolio.

NZ is a Professor of Medical Education at the Institute for Excellence in Health Professions Education, an institute that fosters excellence in educational assessment through education, research and innovation.

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Figures



Figure 1

Study Overview Tutor-driven formative assessments in the first half of the semester were followed by a mid-semester, in-course summative assessment. Student-generated formative assessments in the second half of the semester were followed by a final summative assessment of the course.

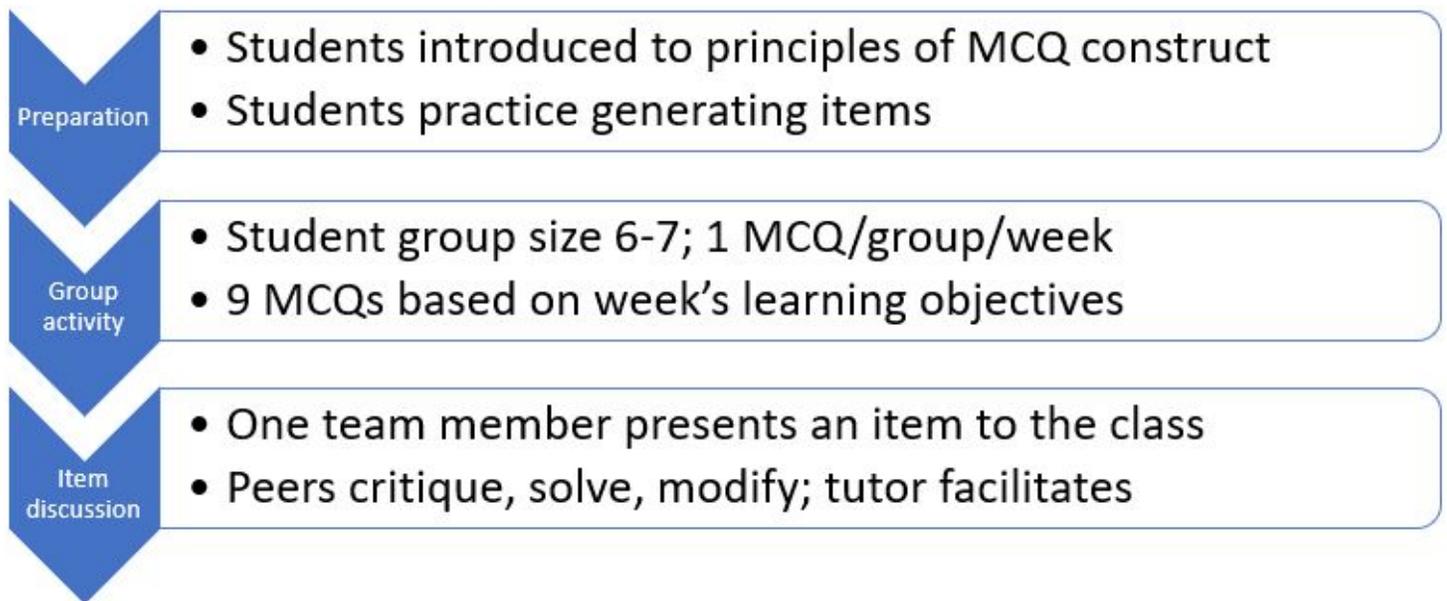


Figure 2

The educational intervention: assessment as learning The educational intervention comprised weekly student-generated multiple-choice questions, created through peer collaboration, supplemented by peer-critique and review, tutor moderation and feedback.



Figure 3

The study's conceptual framework Prominent characteristics emerged from students' perceptions of self-generated formative assessments demonstrating Immediate gains and Expected long-term benefits and validating the educational intervention's utility towards Assessment as learning (AaL).