Article title: Case Item Creation and Video Case Presentation as Summative Assessment Tools for Distance Learning in the Pandemic Era

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Running title: Case item creation as summative assessment

Abstract

There is an urgent need for more diverse methods for student evaluation, given the sudden shift to online learning necessitated by the Coronavirus Disease 2019 (COVID-19) pandemic. Innovative assessment tools will need to cover the required competencies and should be used to drive self-learning. Self and peer assessments may be added to the traditional classroom-based evaluations in order to identify individual insecurities or overconfidence. Identification of these factors is essential to medical education and is a focus of current research. A modified operational assessment was introduced for the evaluation of third-year medical students. This intervention has facilitated sustained education and has promoted interactive student learning. Members of the entering class of 2017 participated in an integrated team and a competency-based online project that involved innovative item creation and case presentation methods.

Results: The new assessment process has been implemented successfully with positive feedback from all participants; a usable product has been generated.

Conclusions: We created new assessment tools in response to the COVID-19 pandemic that have been used successfully at our institution. These tools have provided a framework for integrated and interactive evaluations that can be used to facilitate the modification of traditional assessment methods.

Keywords: Assessment, Assignment, Case-based learning , Competency-based assessment, Self-assessment, Student peer assessment.

Introduction

The outbreak of Coronavirus Disease-2019 (COVID-19) was declared a pandemic by the World Health Organization on March 12, 2020. In response to this declaration, on

March 15, 2020, the central authority in Egypt announced several important and necessary actions, including the closure of schools, universities, sporting clubs, gyms, museums, and public gardens. Similarly, arrangements were put in place to limit the number of employees working on-site at government institutions; employees were instructed to arrange to work from home. The unplanned closure of all medical schools imposed a substantial challenge, as it created the need for a complete and obligatory shift to online teaching and learning. As such, there was an urgent need to remodel all medical school curricula and to include novel and creative methods for student teaching and assessment (Sahu 2020). Of interest, even prior to this date, medical school curriculum reform worldwide has focused on and emphasized the need for independent learning, development of interpersonal skills, and improved capacity for problem-solving (Gareth and Lau 2004).

The sudden shift from face-to-face to fully online education and assessment carried many challenges for the faculty, students, and administration. One of the main challenges was determining how to develop online assessment tools for curricula that had been designed to accommodate traditional assessments (Amin, Mohamed, and Samar 2020). The transition to online assessments is inevitable and will continue into the post-COVID-19 era, due in no small part to the limited number of staff members and insufficient infrastructure and educational resources at our medical school (Daniel 2020).

Case-based learning (CBL) has been in use for several years and was designed to promote a deeper understanding and drive toward self-learning. This type of curriculum provides specific and proactive student preparation prior to their pre-clerkship years and additional phases of their clinical training. Despite the disruptions associated with the COVID-19 pandemic, a set of learning objectives must be efficiently conveyed, and student learning needs to be assessed (Amin et al. 2020).

With respect to the design of the integrated curriculum, enhanced guidance must be provided during online learning sessions. Adherence to learning objectives and the need for suitable methods for student assessment are both essential features of any new program (Akers, Christian and Maya 2020). To achieve this goal, we adapted a CBL approach to the online format. As but one example, online interactive CBL sessions were delivered to students, and video cases of virtual patients were introduced as critical

components of interactive seminars that required student participation and engagement.

CBL has the advantage of flexibility and the capacity to cover numerous integrated topics. The learning objectives of each CBL session are stated clearly. As such, acquisition of skills and knowledge related to these objectives can be assessed clearly and directly. Training provided to both students and tutors is the cornerstone of online CBL success.

In this study, we describe our hands-on experience with these new learning modalities. Case item creation and case presentation videos are implemented as methods for evaluation that were generated with reference to Kirkpatrick's hierarchy of learning Evaluation. Competencies will need to be articulated and mapped in order to perform directed, competency-based assessments. The design of these learning strategies should define expectations with respect to skills that can be measured specifically for each task. A wider scope of competency is achieved with the incorporation of new abilities and knowledge (<https://www.kirkpatrickpartners.com>). Moreover, team-based assignments that include student peer assessments add value to the process (Passi and Southgate 2016; Bloxham and West 2004).

Methodology

Figure 1: Flowchart depicting the creation of student e-assignments

Curriculum design

Our integrated modular curricula are targeted at a multi-disciplinary level (Harden 2000), including CBL through an enquiry-based approach (Amin et al. 2020). A complete shift to online learning was adopted in light of the ongoing COVID-19 pandemic. Objectives were aligned to the skills and competencies required.

We have applied a competency-based plan; a competency matrix was mapped. We have aligned competency-based training with the assessment tools via the methodologies implemented. CBL sessions, poster seminars, virtual patient seminars, and video creation that included case scenarios on integrated topics have all been implemented as educational tools throughout the module.

Assignment design

Encouraging students to participate in active learning with a higher level of engagement in the learning process can be achieved via written-case scenarios and preparing videos. Both written-case studies and video simulations are ways to engage students and encourage active learning (Herron et al. 2019; Amin, Mohamed, and Samar 2020). Students were also asked to include histological images in their case studies; this provided students with a means to connect normal and abnormal histological features with questions addressed by clinically-integrated problem-solving (Brisbourne et al. 2002).

We agreed to formulate a fragmented mega project as the final summative assessment module for the third-year students, including an integrated e-assignment. Two modes are implemented, specifically, case item and video creation. The steps involved include the following:

- i. A template for the case scenarios is created.
- ii. The mega project is fragmented into smaller tasks with a defined role for each student within the team; this will facilitate evaluation of individual students.
- iii. The rubrics are set with task/grade compatibility clearly defined.
- iv. An open online discussion with the students is prepared for defining the purpose of the assessment; the output and anticipated final outcomes are both explained carefully. The students are provided with examples in the form of previous output from their colleagues (The created students' Q-bank).
- v. The students engage in planning to ensure sustainability.

Implementation

- i. The Biochemistry, Histology, Microbiology, and Pathology departments asked the third-year medical students to create mini-case scenarios covering the objectives of the previous module.
- ii. Two demo sessions for the staff members were delivered by a delegate of the Medical Education unit. Online meetings on Zoom Cloud (<https://zoom.us>) were scheduled, with each session lasting 90 minutes. It is worth mentioning that a pilot study was performed previously by the Department of Pathology that provided students with practice in generating case-scenario creation.

- iii. Demo for students: The contributing departments provided mentorship for the students via a pre-organized schedule. Using online meetings on Zoom Cloud, the project rubrics were discussed thoroughly with the students. Some reading resources and material were suggested as well. The meetings were recorded and sent to students who were unable to participate in the Zoom Cloud session.

Delivering the material to the students with the suitable mentorship

Item creation assignment: The students received the file including instructions, rubrics, and templates to be used to prepare each case scenario. Each student was assigned a specified number of cases on distinct topics associated with the integrated objectives. Mentorship was provided throughout the process. The final case presentations were then uploaded.

Video creation assignment: After the meeting, the students were asked to organize themselves into groups of ten. Each group chose their own team leader; a focus group was created with the twenty team leaders. A WhatsApp group was created for this focus group that included two staff members as facilitators (<https://www.whatsapp.com/>). Mentorship was provided for three consecutive days to help the students navigate through any difficulties they encountered.

We asked the students to present their cases through videos which were uploaded with the assignment as an integral part of the project. Videos could be presented in the form of a virtual patient approach. The Skill Gym tool (<https://kbank.skillgym.biz/>) was used to provide guidance to students. Animation video case presentation was also suggested as an option for case presentations. An audio-visual presentation using the Zoom Cloud application was suggested as well. It is worth mentioning that for the preceding two months (March and April 2020), students were preparing, presenting, and attending online seminars under the supervision of faculty members as part of adaptation to the lockdown required by the pandemic. Via these seminars, students presented their case studies using the virtual patient tool.

Assessment

Assessments included the following:

- A committee of three instructors was assigned for the assessment and scoring of the assignments.
- The case reports were checked for plagiarism.
- Individual evaluation of each student was performed by focusing on individual assigned tasks.
- For video creation, the group was assessed as a whole.

Evaluation

After the primary outcome of the assessment was achieved, the secondary outcomes were evaluated via a summer elective project.

- The usable educational product was passed through a multistep reviewing process before it was added to the online platform (Q-bank and video playlist).
- A triangular approach with multiple data collection tools (questionnaires/focus groups/scores) was adopted.
- Evaluation of the students took place via the assessment.
- Evaluation of the staff was carried out using questionnaires.
- Evaluation of the product involved a multistep approach, including Instructor review, Peer review by three students, Instructor evaluation of the review, and Final editing and reviewing prior to publication on the Q-bank and educational video playlist.
- Finally, item analysis was conducted using the Q-bank software (post-validation) that included difficulty and discrimination indices. This was achieved by arranging an online quiz competition where the cases undergoing review were featured (Figure 2).

Figure 2: Kirkpatrick Evaluation Model

Results of the evaluation are tabulated and used for corrective actions [Figure 1]. Experiences associated with the e-integrated, team-based assignments are disseminated. We plan to use these assignments as a part of our integrated module for student training during the post-COVID era as well. We intend on broadening the scope of the objectives in a spiral approach to create interwoven products to be used by the increasing number of the students enrolled at our institution.

Ethical considerations

Faculty of Medicine, Helwan University, Research Ethics Committee for Human & Animal Research (FMHU-REC) has approved this project entitled “Medical Students’ Contribution to Curriculum Reform and Faculty Development” REC no. 24/2020. The

included case study is included as a step in Phase I of this program. FMHU-REC is organized and operated according to the Declaration of Helsinki.

Results

The third-year medical students were able to begin work on their item creation project immediately at the start of the lockdown, because the rubrics had already been clarified, and the required mentorship was provided. The instructor performed regular monitoring of the uploaded material in order to ensure that the students were following the specified rubrics.

Results of the assessment

Regarding the requested histology objectives, the students created cases related to (but in some cases distinct from) the case scenarios in order to provide a clinical context. They have emphasized the value of understanding normal histologic findings in order to be able to explain and diagnose tissue abnormalities. Students clearly perceived the benefits of studying histology in relation to case studies and the relevant histopathology. The focus was on the interpretation of histology as well as the other basic and medical sciences, as this corresponded to the approach taken in the integrated end-of-course assessments. All (100%) students uploaded their project components (case scenarios and videos) before the final deadline. Most of the student projects displayed quite a bit of effort with respect to both the case scenarios and the quality of the videos.

Results of student feedback on the assignment

Forty percent of the students responded to the questionnaire. Eight questions were provided that required responses on a 5-point Likert scale; a final open-ended question was also included [Table 1].

Table 1: Results of student feedback on the integrated assignment

Question	Average rating on Likert scale

1- After having completed your project, how would you describe the item creation experience?	4
2- Did this project help you integrate your understanding of the basic sciences with clinical practice?	4
3- Do you think the students are sufficiently competent at formulating new cases?	4
4- How easy was your specific task?	~3.2
5- While working on the project, did you find it necessary to review the lecture material in order to complete the project?	~3.2
6- Did your medical knowledge increase while preparing this project?	~3.7
7- How responsive was the instructor to your queries (mentorship)?	~3.2
8- Do you recommend this method of assessment?	~3.8

As shown, the overall student feedback was positive. Among the specific points to be considered further, the students asked for more effective mentorship. Some of the students identified technical difficulties when attempting to create a video. The following is a sample of some of the student comments:

“I would like to mention that I loved the feeling of being able to create a full case scenario.”

“It was a very nice experience, and I would like to participate in it again.”

“I hope our faculty will use this method instead of the regular old assignments.”

“I think the students will be more passionate if they believe that these cases will be used.”

“We need more effective mentorship and more flexibility and freedom regarding the template provided.”

“Grading is subjective.”

“Some notes were provided to some students but not to the others (i.e., pointers that include a mention of “all of the above” and “none of the above” are considered flaws). This is not fair to all students.”

“We need more reference material for some subjects.”

Evaluation of the product

Thirty percent of the products are usable and are undergoing preparation for the multistep-review process that will take place over the summer. Some of the students have modified their project, notably the parts associated with the video presentation. These modifications were approved by the tutors.

We were very impressed with the unique, well-structured, problem-based case scenarios prepared by some of the students; these will be added to the PBL bank. The video presentations revealed very creative informative case discussions using virtual patient methodology, animation, and traditional student presentations. We noted from the virtual patient simulations that some of our students are not fully proficient at taking a patient history; this drew our attention toward corrective measures that might be implemented in the near future.

Discussion

Appropriate assessment represents the core of the learning process, as it leads to important learning outcomes through student motivation and direction. The implementation of integrated assessment methodologies is regarded as an integral part of the current process of medical education (Amin, Mohamed, and Samar 2020). Several strategies can be applied toward the effort to select appropriate assessment tools that will

facilitate the testing of multiple competencies despite social distancing. The main purpose of creating and applying this mini-case project assessment tool is that it not only covers almost all the competencies required by the National Academic Reference Standards, but it is also very suitable for online use. This will be a critical feature not only during quarantine periods but may also be a suitable learning modality given the often-unexpected increase in the number of students at our school each year.

The utilization of interactive platforms, including Zoom and Microsoft teams (Microsoft Inc. 2017), in addition to online objective structured clinical examination (OSCE), may serve as an alternative solution to traditional examinations, as it can minimize the need for physical interactions between the student and the examiner (Ashokka et al. 2020). Our assessment tool is quite innovative in comparison with traditional modalities, which typically assess only a limited number of competencies. Our goal was to provide a reliable and valid method for the final summative exam during the COVID-19 pandemic. The positive feedback received from most of the students suggests the more general applicability of the case and creation items as tools for student assessment. The fact that many students had previous experience with these same tools during their formative assessments played a significant role in their use in the final summative assessment.

Continuous modifications can be applied to already-existing assessment tools; as such, they can be tailored and refined to facilitate the evaluation of additional competencies and/or can help students acquire new skills (Brouwers et al. 2019). Innovations and presentation of alternative tools for assessment as part of the process of adapting to instability is termed an authentic assessment. Such creative methods should stimulate student performance, as they are being asked to present knowledge in ways that simulate situations that they will ultimately face in reality (Berman et al. 2016). In our situation, third-year medical students were assigned an item creation project and asked to prepare a module featuring an objective-based mini case. This project was used as an alternative assessment tool and replaced the final exam that would ordinarily take place at the end of the module.

As previously stated by Hart (1994), assessment planning should include a blended combination of performance assessment, portfolios, and systematic observations.

In this study, students were asked to present prepared cases via a video as an integral part of their project. Videos were created using the virtual patient approach and were guided by the Skill Gym tool.

We would also like to mention that for the preceding two months (March and April 2020), students were preparing, presenting, and attending online seminars under the supervision of faculty members as part of the adaptation to the lockdown necessitated by the COVID-19 pandemic. Through these seminars, students presented their case studies using the virtual patient tool. These formative assessments implemented throughout the lockdown were the main drivers promoting the successful implementation of these tools for summative assessments (Preston 2020).

It was perhaps no surprise that after a team brainstorming session, some students suggested simulating the virtual patient videos and creating the patient–doctor dialogue by themselves. Their suggestions were accepted as part of our acknowledgment of their creative thinking for this project. As this project has become a cornerstone in the educational process, the learner must also be an active contributor who is capable of interacting enthusiastically with teachers in a changing environment (Kaufman and Mann 2014).

The design of clear, specific rubrics for the assessment project was an indispensable part of this process. Rubrics ensure that our assessments are consistent and provide an established guide for students who are using this new assessment tool. The students responded with enthusiasm to the project and began working immediately. The students divided themselves into teams; each team received its assigned objectives with respect to case scenarios and required video presentations. With mentorship from the faculty and staff, each team prepared case scenarios and video presentations that included virtual patient simulations, animations, or case discussions that were presented using the Zoom application. A feedback survey was designed using Google forms; all students were invited to give their opinion about this assessment tool.

In conclusion, our need to respond to the COVID-19 quarantine provided us with a golden opportunity to assess the feasibility of changes in methods of student assessment and to promote the use of integrated and interactive tools. In the current COVID-19 era

that has national as well as international impacts, there is an ever-increasing need for more validated evaluation tools (Ferris and Flynn 2015; Sohrmann 2020).

Take home message

- CBL is a customizable tool; CBL-item creation imparts relevance for students, as it ties theory to clinical practice.
- CBL-item creation is an innovative method that is both practical and efficient as a mode of assessment for adult learners.
- Students' insights into the project promote value with respect to the learning process.
- Students' contributions to planning for the assigned project promote engagement, enthusiasm, and self-esteem and enhance both learning and professionalism.
- Mentorship with constructive feedback drives student learning and facilitates the acquisition of new skills. However, tutors should be trained regarding modes of constructive feedback.
- Clear instructions and explicit rubrics for grading are essential.
- The adopted collaborative mega project, which involves assessment tasks carried out over several modules with an optional extension through summer electives, may alleviate the mental stress associated with traditional assessment methods.

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