A Quality Assurance Template for Revision of Case Based Learning Modules

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ABSTRACT

Case Based Learning (CBL), a form of small group learning developed from the same educational theories as Problem Based Learning (PBL), is becoming increasingly prevalent in North American medical schools. At University of Ottawa, approximately 20% of scheduled class time is devoted to this pedagogical method. Despite the importance of this method, a review of the literature found that no formal tool has been developed to assess the quality and consistency of these cases. The objective of this project was to develop a tool that would allow a standardised approach to the quality review of CBL cases. We analysed the first five CBL cases in the curriculum and noted the most important features of each one. We then created a checklist template and tested this tool against another 12 CBL cases. By incorporating this tool into the CBL development cycle, one can ensure that all new and revised CBL cases provide a consistent learning experience across the medical curriculum.

Keywords: *Learning modules, Case based learning, PBL, CBL, Quality assurance, Template*

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INTRODUCTION

Much has been published about the importance of active learning in adult education. Studies have found that pedagogic techniques that promote learner participation result in the development of critical thinking skills (1, 2), clinical decision making ability (3), and greater overall academic success (4). Until recently, most medical schools incorporated active learning into their curriculums through a learning activity known as problem-based learning (PBL). However, a new strategy, known as case-based learning (CBL), is becoming increasingly popular in medical curriculums across North America, including in programmes at University of California Los Angeles, University of California Davis, University of Medicine and Dentistry of New Jersey, and the University of Ottawa (5–7). Although much has been written about the proper concepts and methods for designing these case studies (8, 9), a review of the literature published in multiple journals and databases (including PubMed, Web of Science, Academic Medicine, BMC Medical Education, and the Canadian Medical Education Journal) found no significant resource that provides a step-by-step guide for developing and evaluating medical CBL cases. Building upon the theoretical research framework that has already been published, we sought to develop a functional tool that will allow authors to easily construct a case that is fair, engaging, and relevant to their students' needs.

METHODS

There were five phases (Figure 1) in the development of our CBL template tool: literature review, case review, template construction, student testing, and faculty testing. Modifications were made to the tool after each testing phase.

Literature Review

Initially, we sought to develop a preliminary understanding of the vital processes that should govern case content and structure to determine the core characteristics that should be found in a CBL case. We focused on topics such as adult learning styles (10, 11), collaborative learning (12, 13), and conceptual case writing strategies (9). We then researched the differences between PBL and CBL to ensure that our template would conform to the CBL philosophy.

Case Review

We reviewed the first five CBL cases in the University of Ottawa's Foundation Unit and compiled a list of what we determined to be (from a student's perspective) the positive and negative features of each. Additionally, we reviewed the feedback provided anonymously for each CBL by students during the school year.

Template Construction

During the template design phase, our ultimate goal was to create a tool that was flexible enough to accommodate any type of medical CBL case, but rigid and detailed enough to ensure consistency across many CBL cases. Using the feedback that we had compiled in the case review phase, we developed a step-by-step checklist that can be used by an author for developing new cases. We chose this format due to its inherent familiarity for authors, which we hoped would greatly enhance its ease of use and thus its adoption. Subsequently, we developed a simple evaluation legend (Figure 2) that allows this checklist to function as a case evaluation tool as well.
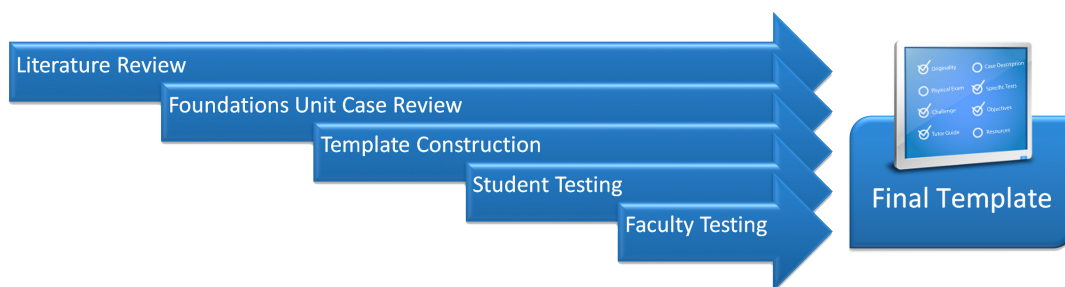

Figure 1: The five development phases.

Evaluation Legend:

Symbol	Meaning
☐	This point applies equally to Part I and Part II
☐ ☐	The left most box is Part I. The rightmost box is Part II
✔	Criteria is properly met
⊟	Criteria is not applicable
⊡	Criteria is not properly met / re-evaluation is necessary

Figure 2: The evaluation legend.

Student and Faculty Testing

We then tested the first draft of our template against the remaining seven CBL cases in the Foundations Unit. After each case evaluation, we returned to the template construction phase to correct any deficiencies in our template. Upon completion of the 12th CBL case, we submitted a final draft to one of the authors, RB, who tested the tool against the CBL cases he had authored in Unit I. This feedback was subsequently used to refine the final version of the tool.

DISCUSSION

To design an effective CBL case development tool, we first had to completely understand the core characteristics of CBL and how it differs from the more traditional PBL. A review of the literature revealed that although CBL and PBL are both interactive small-group learning strategies, they differ significantly in approach. While PBL emphasises complete student autonomy and self-directed learning with minimal intervention from faculty (14), CBL has been developed to provide a more guided approach. For example, in CBL, faculty helps to focus students by providing learning objectives before the case begins, thus allowing the students to prepare ahead of time and ensuring that all students have covered the same objectives by the end of the case. Faculty also encourages learners to prepare for the case by providing resources such as didactic lectures, pertinent literature, and self-learning modules well in advance (6).

We then found an inspiring analysis by Kim et al. that reduces 17 important writing strategies into 5 primordial case attributes: relevant, realistic, engaging, challenging, and instructional (9). These core concepts, along with the data we collected in our case review phase, were subsequently used to write the first draft of the template. The draft was then tested against the first 12 CBL cases (see Methods) and refined accordingly.

Early Results

The final draft was then sent to one of the authors, RB, an author of multiple CBL cases in Unit 1, who was asked to test the tool against his cases. As mentioned above, a major goal in our project's template development phase was to create a flexible but functional tool that was easy for authors to understand and implement for new (as well as current) CBL cases. RB was able to identify potential concerns and implement important improvements in areas such as originality of title, improvement of presentation of and explanations for radiologic images, important updating of resources, and improved explanation of objectives in the tutor guide. These changes, which have already been integrated into the Unit I curriculum, have these cases more valuable by increasing the clarity of the information provided. With the help of this tool, Unit I was able to add new resources and to ensure that all of the pertinent information (such as proper explanations of objectives, review questions, radiological images, and pathological specimens) had been provided either in the case or within the tutor guide. Accordingly, we feel that these CBL cases have been made more reliable between groups, as the quality of the session is no longer as dependent on the quality of the faculty tutor assigned to each individual group.

As for ease of use, RB hailed the template as being "well-organised and easy to use". He also found the template to be "very thorough, covering all aspects of a CBL case module" and that it quickly allowed him to make "several important changes (to his CBL case) that significantly improved its educational value".

Further Research

To be successful, a medical curriculum must be tailored by each school to respond to its unique needs. That said, we feel that our template can be easily adapted to fit the needs of any curriculum, including PBL

and CBL systems. In the future, we plan to reach out to members of other institutions in an effort to test and refine our tool against their diverse curriculums. This constant evolution will ensure that our tool remains dynamic, up-to-date, and easily applicable across multiple systems.

We are concurrently in the early stages of a pilot project to design an interactive form of CBL for the University of Ottawa's curriculum. Due to the unique nature of this novel adaptation of CBL (the details of which will be discussed at length at a later date), minor changes and additions will have to be made to our template (Appendix A). Once we have a near-final version of our interactive CBL case, we will begin to validate and refine our current iteration of the template using the same methods described above.

Challenges and Opportunities

While the development of our template proved to be straightforward, we encountered one major challenge during its development. During our testing phase, we realised that we needed to modify our original template to ensure it was sufficiently structured to promote consistency across cases, but flexible enough to accommodate the wide array of potential case topics in a medical curriculum. To do so, we collaborated with numerous authors and unit leaders to make changes that will alleviate these concerns. Nevertheless, we still encountered resistance while trying to implement this tool in the curriculum. Resistance to curricular change, a common theme in the literature (15–19), may be attributable to numerous causes. One potential explanation is the increasing bureaucratisation of medical education in which prospective changes have to be approved by numerous faculty members, focus groups, and committees to take effect. It has also been proposed that "medical teachers often (relate) to the notion of teaching as a 'private business'" (16) and that the "protection of territorial domains supersedes the achievement of educational goals" (18). These possibilities, among many other potential factors, can make implementing change a difficult task at any institution.

If implemented properly, this tool has not only the potential to make a curricular transition from PBL to CBL more efficient, but also to enable significant improvement of existing CBL curriculums. Additionally, the tool will simplify the case development process for authors, allowing them to spend more time on important content.

ACKNOWLEDGEMENTS

APPENDIX A: THE UNIVERSITY OF OTTAWA CBL DEVELOPMENT TEMPLATE

Evaluation Legend:

Symbol	Meaning
☐	This point applies equally to Part I and Part II
☐ ☐	The left most box is Part I. The rightmost box is Part II
✔	Criteria is properly met
━	Criteria is not applicable
⊡	Criteria is not properly met / re-evaluation is necessary

Content Section:

	Title	
☐	Must not contain clues to the patient's illness.	
☐	Can be the name of the patient.	
☐	Originality is preferred.	
	CBL divisions	
☐	Each CBL must have a minimum of two parts.	
☐	The parts may relate to one another (e.g. can represent the evolution of the same pathology).	
☐	The parts may also be of two different patients, whom have two different illnesses that are still related to the week's theme.	
	Each of the following subheadings must be found in both Part I and Part II	
	Case description	
☐ ☐	Must be concise.	
☐ ☐	This section focuses primarily on patient history and does not include current physical or laboratory exam findings.	
☐ ☐	Can present symptoms and/or risk factors that this patient would exhibit.	
☐ ☐	A picture of a typical patient with the disease (as realistic as possible) is preferred.	
☐ ☐	Should not present the point of view or opinions of people other than the patient himself. You may add this in a "Supplementary history" section (see below for more information). Note: Comments from parents of children are allowed.	
	Physical examination	
☐ ☐	Should discuss all the physical exams that would be done if a real patient were to present with the symptoms described in the case description and supplementary history sections.	
☐ ☐	Data should be shown even if the exam was normal – the students should be able to identify if it is abnormal or normal.	
☐ ☐	For special tests, links should be added so students can learn how to do the test and how to interpret the results.	
☐ ☐	Should always have a minimum of three different physical findings (depending on the specific differential diagnosis of the case).	
☐ ☐	If applicable, pictures should be added to help students visualise the patients' physical appearance/condition.	

☐ ☐	**Diagnostic tests**	
☐ ☐	Each test should have its own link from the "Diagnostic tests" page.	
☐ ☐	Each link should bring the patient to "real" test results; similar to ones the students will encounter TOH (where possible).	
☐ ☐	For each picture (CT scan, MRI, XRAY, blood smear…), the author must provide a link to a similar example taken from a normal patient.	
☐ ☐	The test should not be interpreted for the students before they have had the chance to discuss it (a link/interactive SLM style question can be used instead).	
☐ ☐	All test results should be expandable (i.e. the students should be able to click on the picture of the test result to enlarge the image).	
	Laboratory analysis	
☐ ☐	Data for each lab test done should be presented, even if they are normal.	
☐ ☐	The data should closely resemble the findings one would find in a real life patient.	
☐ ☐	If applicable, data permitting the students to narrow down the DDx should be provided.	
	Radiology section	
☐ ☐	All the pictures presented should relate to the case as close as possible.	
☐ ☐	Students should be provided an explanation of each picture either in the case, or in the tutor guide (please do not provide this explanation along with the scan; allow the students to try to interpret it themselves first. The explanation can be provided in a link).	
	Special or Specific diagnostic test	
☐ ☐	The videos/pictures/values should have a note highlighting the important aspect/findings of the test.	
☐ ☐	If the tests were not discussed during class hours, the author must provide a link explaining the test and its results (note: it is a good habit to place a link explaining ALL special tests presented in the CBL under the "Resources" heading).	
	Diagnosis & plan	*Tip: After revealing the diagnosis, prompt the students to come up with their own treatment plan before revealing the author's suggested treatment plan. This is also a good opportunity for an interactive section (such as: "Which one of the following treatments would you pick?" and offer links to 4 or 5 treatments. Make sure to explain why the right answer is better than the others).*
	It is in this section that the final diagnosis should be revealed.	
☐ ☐	Following the diagnosis, a plan of action must be revealed.	
☐ ☐	The plan may include pharmacotherapy, alternative and/or complementary medicine or physical treatment (e.g. CPAP machine).	
☐ ☐	This section should also discuss the short and long term evolution of the disease, as well as the prognosis. It should also take into account the long term follow up plan (including family physician involvement, other specialists, nurses, associations, centres…).	
☐ ☐	If relevant, this section should also discuss the social aspect of the disease and how its effects can be minimised.	

		The following subheadings are OPTIONAL and may be used where necessary.	
☐ ☐		**Supplementary history**	
☐ ☐		Allows student to form questions on their own after reading the case description.	
☐ ☐		This Hx can be given by the patient himself, or by a family member.	
☐ ☐		It can be written as a Q & A way, or in paragraph form.	
☐ ☐		Should include answers to question that would rule out or rule in certain possible diagnosis in the DDx list.	
		Additional tabs	
☐ ☐		Must comprise more than a paragraph of information.	
☐ ☐		Should not be part of a previous tab (e.g. should not be a link from the physical exam or a diagnostic test).	
☐ ☐		Would be preferable if it included a picture or a table if it is to present a new concept.	
		Continuation (ex: "4 weeks later…")	
☐ ☐		Appropriate if the pathology or illness is chronic, if the case isn't long enough or if the second part of the CBL does not relate to the same patient.	
☐ ☐		Should be concise, and include a new plan of action if ever there is a change in the patient's condition.	
		The following criteria apply to all sections and subsections of the CBL	
		Promotion of critical thought	
☐ ☐		The CBL should contain pieces of "distractor" information that promote the students to make differential diagnoses.	
☐ ☐		The exact diagnosis must not be apparent until all of the information (physical exam, lab tests, etc.) are provided.	
		Time management	*Tip: A 2 hour CBL should take approximately 30 minutes to read through, without discussion. A 3 hour CBL should take approximately 45 minutes.*
☐ ☐		Students are allotted 2 hours for Part I and 3 hours for Part II. The length of each CBL should reflect this fact.	

Administrative Section:

	Learning objectives	*Note: Although there is no set limit defining the amount of objectives permitted, we suggest a maximum of 8 objectives as all students are expected to briefly review each of these objectives before attending the CBL session.*
☐	Students must be provided a list of all the objectives covered during each CBL session.	
☐	Objectives pertaining to Part I of the CBL must be clearly identified and distinguishable from those pertaining to Part II.	
☐	Objectives must be concise.	
☐	Objectives must be precise.	
☐	Objectives must be relevant to the case.	
	Preparation tasks (mandatory)	*Note: These should be concise enough that students can read them in 1–2 hours and have at least a small knowledge base of the week's CBL content.*
☐	Must contain one or more resources that will allow the student to prepare for the CBL.	
☐	Can include articles, chapters in books or specific websites that explain new medical concept.	
☐	Should provide an overview of the most important aspects of the case's learning objectives.	

Resources		Tip: Short, concise resources are more helpful to students than long, complicated ones. Resources with pictures or animations are also helpful to the visual learner.
☐ May include articles, books or specific websites subject to help students answer the learning objectives.		
☐ May also include pertinent websites from reputable sources such as other hospitals, schools or well–known associations.		
☐ Provides a PubMed or PDF link for each article listed.		
☐ On an annual basis, please ensure that all links remain active.		
CBL footer		
☐ Should always include the following:		
☐ Subject Matter Experts		
☐ Editorial Committee		
☐ Instructional Design		
☐ Programming & Graphic Design		
Copyrights		
☐ All the pictures, tables and results of tests shown must be property of the Faculty of Medicine.		
☐ If pictures of real patients are used, the patients must give a written consent.		
Language		
☐ ☐ Must use the correct medical terminology at all times (exceptions can be made for patient quotes).		
☐ ☐ The entire CBL must be correctly translated into French, and must be approved by the content expert or by a French speaking specialist.		
Tutor guide		Tip: While writing your tutor guide, please remember that not all tutors are subject experts or specialists, and may rely heavily on this guide. It will also be provided to students as a study tool after the completion of Part II of each CBL.
☐ Should begin by providing the tutor a case overview/summary and learning flow.		
☐ Must provide a well–developed and complete differential diagnosis for the patients' afflictions.		
☐ Contains explanations, answers or key points the student should discuss regarding the case description, physical exam, diagnostic tests and treatments of the CBL session.		
☐ Thoroughly explains the results of all diagnostic tests (CT, MRI, XRAY, Lab tests…).		
☐ Provides prompting questions for tutors (in order to ensure discussion among students).		
☐ Provides answers to all questions asked in the CBL, as well as in the tutor guide (i.e.: prompting questions).		
☐ Is a useful tool for CBL tutors to guide the students in the right direction during the sessions.		
☐ Is a useful tool for students preparing for their exams.		

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