A PERSONAL VIEW

How about including free-standing, open-ended questions for readiness assessment and application activities in team-based learning, in addition to MCQs?

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Submitted 16 December 2019; accepted in final form 6 January 2020

Praakash ES. How about including free-standing, open-ended questions for readiness assessment and application activities in team-based learning, in addition to MCQs?. Adv Physiol Educ 44: 62–64, 2020; doi:10.1152/advan.00168.2019.—In conventional team-based learning (TBL), readiness assurance test (RAT) items must be formatted as free-standing multiple-choice questions (MCQs). Even in the application phase of TBL, all teams must work on the same, significant problem and be required to make a specific choice and simultaneously report them to the whole class, which the MCQ format with predetermined answer choices allows. However, the founders of the TBL method rightly emphasize that the intended learning outcomes of a course using TBL underlie the design of the various components of TBL. The main point of this brief essay is to suggest that, if the ability to generate solutions to problems without predetermined answer choices is an intended learning outcome, it is advantageous to include carefully constructed free-standing, open-ended questions (OEQ) for both RAT and application activities in courses using TBL as the primary instructional method, in addition to the use of MCQs. Free-standing OEQs are OEQs not linked to an MCQ used for RAT or application activities. How this might be incorporated in what one may envision as TBL is discussed.

INTRODUCTION

Team-based learning (TBL) is an active learning method emphasizing collaborative learning, application of knowledge, peer feedback, and the formation and sustenance of productive teams of learners. It has grown to be a popular and effective method that underlies the design of the various components of TBL. In conventional TBL, readiness assurance test (RAT) items must be formatted as free-standing multiple-choice questions (MCQs). Even in the application phase of TBL, all teams must work on the same, significant problem and be required to make a specific choice and simultaneously report them to the whole class, which the MCQ format with predetermined answer choices allows. RATs are primarily intended to check on learners’ mastery of content in preparatory reading and facilitate development of team cohesion and consensus building (4, 6), and readiness to move on to the application phase, where the focus is on application of knowledge. Similarly, in the application phase, requiring a team of learners to make a specific choice on a complex problem requires application of course content is explained to be essential so that team members do not limit themselves to participating in segments of a complex task (4). I do concur with this justification, and the use of well-written multiple-choice items with a single best answer may serve this purpose well.

However, the founders of the TBL method rightly emphasize that the intended learning outcomes of a course using TBL underlie the design of the various components of TBL (6). The main point of this paper is to suggest that, if the ability to generate solutions to problems without predetermined answer choices is an intended learning outcome, it is advantageous to include carefully constructed free-standing, open-ended questions (OEQ) for both RAT and application activities in courses using TBL as the primary instructional method, in addition to the use of MCQs. Free-standing OEQs are OEQs not linked to an MCQ used for RAT or application activities.

An example of a free-standing, open-ended RAT item in a renal pathophysiology session might be:

In a 40-yr-old man with a 10-yr history of type I diabetes, HbA1c of 10%, serum creatinine of 1.6 mg/dL, and persistent dipstick positive proteinuria, which class of drugs has been shown to inhibit progression to end-stage kidney disease?

While this item can be easily formulated into an MCQ with one best response, an MCQ with one best answer will bring with it the cueing effect of a short list of answer choices, an effect absent in carefully constructed OEQs (9). The cognitive process in the case of an OEQ is problem representation, followed by a formulation of solution, following a search in the respondent’s memory, not recognition of a solution from a set of answer choices (9). The correct answers to this question include angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers, or examples of drugs from one of these classes. One may also add this question to the RAT item above:

Could you explain the mechanism of benefit of this class of drugs in terms of its possible effect on intraglomerular capillary hydrostatic pressure and proteinuria?

I use such items in virtually all types of teaching-learning encounters, small-group tutorials, one-on-one discussions, as well as interactive large-group (60–120 learners) sessions for medical students in a clinically oriented pre-clerkship curriculum in a Doctor of Medicine program, in addition to MCQs.
At the level of what might be envisioned as a team RAT, I allocate an appropriate amount of time for groups to discuss and formulate a group response to each item, elicit responses from two to three groups at the level of the whole class, and discuss the item at the level of the whole class immediately before moving on to the next RAT item. This ensures immediate feedback to the whole class. In terms of application of knowledge to solving authentic problems, an example would be:

A 6-yr-old child presents with a history of generalized swelling of her hands, feet and eyelids for the past 5 days. Obtain a focused history, perform a physical exam, and formulate 1–3 provisional diagnostic hypotheses based on this (time: 25 min).

For a second-year medical student in a clinical skills course, and whose clinical experience is limited, this may entail applying knowledge acquired in other courses, including the renal and cardiovascular systems and fundamental clinical skills, and the task is an OEQ that cannot be substituted with an MCQ.

In my experience, this approach has been well received by students, even though I continue to see requests for more MCQs from some students. The latter might be related to the fact that the high-stakes Step 1 of the United States Medical Licensing Exam exclusively uses multiple-choice items with one best response. Regardless, as discussed by Veloski et al. (9), I would continue with my approach considering long-term educational goals for learners, because, in real life practice, the right questions and answers (diagnostic hypotheses, best management option) have to be generated by the physician.

The interactive large group sessions that I alluded to above depart from conventional TBL in multiple respects in that there is not a neat demarcation between RAT items and application exercises, and teams are not strategically formed and permanent. They are one-off sessions typically ~2 h long, meant to allow a content expert to optimize class time to exemplify application of a substantial range of core concepts, and they entail active participation by students. Furthermore, as an instructional method, it is used in the curriculum in combination with case-based reasoning in small-group (n = 7–8) tutorials led by a faculty facilitator. In the setting in which I teach, my personal goal is to model intrinsic motivation, and, therefore, I do not grade responses to RAT items and application exercises. Practically, this makes implementation of OEQs very easy, although one might be concerned that individual learners are not immediately held accountable, as they are in TBL. Rather, student preparedness for, and participation in, discussions in class meetings over a course or module is a facet on which I am expected to provide feedback, particularly when I facilitate small-group tutorials.

To be clear, I am not suggesting that MCQs with one best answer be abandoned for RATs and application activities in TBL and be replaced entirely by OEQs; neither am I arguing that OEQs are superior to MCQs. Each assessment tool has its strengths and limitations. My perspective is that of comparing and contrasting the educational basis of pedagogies, such as case-based reasoning, problem-based learning, and TBL, to see if strong features in one method/philosophy could be incorporated into possibly augmenting the educational effect of another, as discussed by Dolmans et al. (2). OEQs are an integral feature of problem-based learning. Programmatic assessment, a vision for holistic assessment of competence and one that seeks to optimize assessment for learning and assessment of competence, emphasizes that the choice of assessment tools should primarily be determined by the educational justification at a certain point in the curriculum and its contribution to the assessment program as a whole (8). The National Board of Medical Examiners has introduced short-answer questions in the Medicine Clinical Science Subject Examination since 2018 (5). As long as questions posed are appreciated by learners to be significant, and the resulting discussions rigorous, intended learning outcomes of a course using TBL are of greater importance than the need for simultaneous report of specific answer choices to complex problems, and, in my view, this is consistent with the “backward design” process stated to inform development of TBL units (6).

Many faculty who use TBL react to this by saying that they already do this, in facilitating class discussion of MCQs in RATs, and that this could be done in devising gallery walks and 4S activities. Gullo et al. (3) recommend the use of neutral questions and OEQs to facilitate in-depth discussion in TBLs.

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I understand that a key design principle in TBL is that extrinsic motivational influences in the form of grading RATs are essential to enhance learner accountability and preparedness for effective participation in in-class activities and team cohesion (4, 6). If responses to OEQs need to be graded, Sam et al. (7) have shown that they can be reliably graded. This can be achieved by incorporating an enhancement within InteDashboard or a similar TBL management system that would allow submission of brief constructed responses to OEQs at the level of individual readiness assurance tests (IRATs) and team readiness assurance tests (TRATs), peer group review and interteam feedback on constructed team responses in TRATs in real time, and instructor review of constructed responses by all teams in real time. A prototype of an exercise using a combination of multiple-choice items and OEQs, based on a mini-case is included in the supplemental material (available at https://doi.org/10.6084/m9.figshare.11594694.v1). In this model, grading of OEQs might be accomplished by TBL instructors, teaching assistants, or learners following clarification by the instructor on RAT items. This might be adapted to face-to-face TBL classrooms in which teams have mobile devices to simultaneously submit a brief response to OEQs in TRATs, in the form of gallery walks for application exercises, as well as TBLs done entirely online. A challenge might be that, with OEQs, an array of responses may be “correct,” and
instructors must be competent enough to respond on the fly to
a range of questions (requests for clarification, appeals) and
learner responses, as well as have a written set of acceptable
answers to an OEQ, if they wish to delegate grading to
teaching assistants or learners.

DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the author.

AUTHOR CONTRIBUTIONS

E.S.P. drafted manuscript; edited and revised manuscript; approved final
version of manuscript.

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