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Active review sessions can advance student learning

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Favero TG. Active review sessions can advance student learning. *Adv Physiol Educ* 35: 247–248, 2011; doi:10.1152/advan.00040.2011.—Traditional review sessions are intended to help students learn and prepare for upcoming exams. Most sessions are passive question and answer sessions that look backward at content deficits rather than advancing student learning. By incorporating active and cooperative learning approaches during a review session, students are able to recognize critical concepts and better prepare for physiological problem solving. Active review sessions help students prioritize the knowledge and develop the thinking skills will be required of them on the exam.

cooperative learning

STUDENTS FREQUENTLY REQUEST review sessions to help them prepare for exams. For many years, I thought it wasteful to devote precious class time to material previously covered. With competing class and work schedules, it was almost impossible to find a convenient time that accommodated both our schedules. Most students didn't want to arrive at before 8 AM, a time when no classes are taught and I was regularly available, and I was not excited about staying after 10 PM, when most evening classes have ended. Even with careful planning, attendance rarely rose above 30%.

Considering the time and effort I put into review sessions, I began to wonder if the sessions helped students perform better on exams. This question was answered in a report by Jenson and Moore (5). They noted that students who attended one or more help sessions earned higher grades than those that did not. This result was not surprising, but the authors were able to determine that those higher grades were less related to help session attendance and more related to the "characteristics" of better students. They noted that students who are likely to attend help sessions also attend class more, study more hours, and are more likely to do the extra credit work.

Traditional review sessions often use a reiterative question and answer approach that backfills content deficits in student learning. Rarely does this approach lead to deep learning or prepare students for an exam. To put learning at the forefront of the review process and to reach those students most at risk, I redesigned my review sessions. First, I changed was the timing of the review and incorporated it within the regular class schedule. If struggling students needed my help the most, then why arrange for an extra session they are unlikely to attend? By labeling the session as "review" or "test preparation" on the syllabus, I guaranteed near-perfect attendance.

Second, I changed the focus from "content" to "problems." In his recent address and article, Steven DiCarlo noted that the explosion of physiology knowledge has made it impossible for faculty members to teach and undergraduates to learn in a

single course (3). He argued that "to attempt" to cover the content "would limit students to simply learning facts without the ability to apply their knowledge to solve novel problems." Disciplinary content functions to provide a knowledge base and is used to develop problem-solving skills; it is not something to be covered.

Because of the vast amount of information in textbooks and other electronic media, most students today have a difficult time discerning the essential content of the discipline and how it might be used to solve problems. With such an intensive content focus, an attribute often recognized as "rigor," students may spend 80–90% of their time reading, listening, and organizing content with little time devoted to thinking through applications of content to solve problems. Covering content without providing an opportunity to use, link, or apply it is of little educational value for current and future physiologists.

I have used two similar but different strategies that incorporate both active learning (1) and peer (2, 4) approaches to facilitate student learning. These strategies have turned my poorly attended and often less helpful content-driven review sessions into learning opportunities for both the faculty member and students.

Strategies

Open-ended strategy. With this approach, I come to class with overhead transparencies and a set of markers. I begin the session using a "think/write, pair, share" (TPS) (7) activity by asking each student to write down the five most important facts, theories, or concepts from the current section of the course. After a few minutes, I have students pair up with three other students and compare their answers. I then take a quick tally by listing topics on the overhead and noting the frequency in which they were cited by students. I then add in concepts that students might have omitted. Finally, I rearrange the topics for students in order of importance, and we discuss why these are critical topics to focus on for the upcoming exam.

This exercise helps me understand their current state of their thinking. What do they think is important? When discrepancies exist between my list and theirs, I will often ask students, time permitting, why they selected the topics they did. Regardless of the reason, this activity provides me the opportunity to refocus their efforts on the most essential topics and concepts.

However, I don't stop there. Using an extension of the TPS model known as "formulate-share-listen-create" (6), I hand each group a transparency and ask them to generate two or three multiple-choice questions from the list of generated topics. Their questions are rarely well devised, but the purpose is for them to take critical content areas and think about how the content might be used in an exam question. Each group then brings their questions to the overhead, and we collectively answer them. Students regularly question each other on confusing language or selection of the answer, again revealing what students know (or don't) and how they know it. Time

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permitting, we rewrite the questions so they could be exam worthy.

Closed-ended strategy. Alternatively, my closed-end approach is more intentional and scripted. I generate a list of 8–10 questions typically taken from previous exams. The questions are selected to highlight key content areas and common physiological problems. I typically avoid knowledge or comprehension questions and focus on application-, analysis-, and synthesis-type questions for two reasons. First, basic content must serve some higher-order purpose than just disconnected pieces of information. I want students to focus on problems, not just content. Second, before they attempt to solve the problem, I have students outline the key concept pieces of the problem. Working individually and then in groups, students are asked to outline the required content and any possible strategy for solving the problem. I try to get students to hold off on selecting the answer. Too often, I find that student learning short circuits when they attempt to identify the answer without first indentifying how to solve the problem. It is my intent for students to first practice and then compare problem-solving strategies. Many students get stuck on the problem-solving stage, but with practice they are able to work through answers with their peers, a well-recognized learning strategy (2).

Finally, I always make sure to put a “troublesome” or “tricky” exam question as part of the session. Talking students through how they can approach and solve difficult exam questions gives me an opportunity to discuss the value and importance of such exam questions in the learning process. Invariably, students will want to talk about these tricky questions after the exam. However, after the exam, their level of frustration and lingering concerns over their grade are likely get in the way of listening and learning. Explaining challenging questions before an exam gives students a better chance of learning how to problem solve before they are in the middle of a stressful exam.

Like many teachers, I fought against trading “content” or course time for an entire class period devoted to a review session. Over time, I came to the conclusion that if I wanted my students to become problem solvers, I had to provide them with low-stakes opportunities and time to solve them. More importantly, I knew that I was the students’ best resource for exam preparation. Working with them on problems demonstrates, in a meaningfully tangible way, that I am interested in their learning and am not just the person delivering content during lectures.

Both of these approaches leave students frustrated during their first encounter. Most students expect a typical review session where a few students will ask most of the questions and the remainder will passively take notes. Some students come to the first review session prepared and just want to check their preparation, but the majority are unprepared and anxious. Students need to learn something about themselves as learners. While the majority of faculty members and teachers are curious, born to learning, and enjoy problem solving, most students are not. Over time, I’ve recognized that I couldn’t help them become better physiologist until I helped them become better learners. This active learning and peer-driven approach accomplishes just that.

Using these review activities, students find out if their choices about their exam preparation are adequate. Many students quickly realize that they are not. Recognizing their shortcomings among their peers and in small groups allows them to form informal study peer groups to better prepare for the exam.

I believe these active review sessions have several advantages compared with traditional question and answer sessions. First, I can use the review sessions to call attention to the learning processes associated with success on tests and evaluations. Second, despite students’ initial frustration with the more engaged activities, these sessions reduce the pretest anxiety that often accompanies first or other high-stakes exams. Finally, the honest discussion of test questions before an exam helps remove any hidden agendas they believe I might have. Outlining those troublesome review questions lets students know more about the intellectual demands of the discipline but also helps them recognize that I’m on their side and genuinely interested in helping them achieve their goals for learning.

Surprisingly, these review activities have illuminated the strengths and weaknesses of my own teaching. By engaging students and making them responsible for summarizing, integrating, or synthesizing the information, students make visible to themselves and the teacher the depth (or lack thereof) of their knowledge. For example, I may have thought I delivered a crystal clear lecture on osmotic gradients and the counter-current mechanism in the kidney only to find out at the review session that students missed the most critical points. The review sessions helped me identify content areas that needed attention, something that end of the semester course evaluations do not.

My review sessions now highlight student problems in ways that traditional unscripted question and answer sessions do not. Review sessions should give students tools to direct and focus their learning in addition to providing the answers they seek. These active review sessions help them prioritize the knowledge and develop the thinking skills that will be required of them on the exam. Teachers can avoid the passive question and answer sessions by incorporating active and peer-supported approaches and, in the long run, help students learn.

DISCLOSURES

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

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