Make Review Sessions More Productive Learning Experiences
Instructor Guidelines

Review sessions are opportunities for students to relearn and consolidate topics they studied previously. Typically, review sessions take place at the start of a course, prior to course exams, and at the start of class periods. Review covers content and skills students have already learned or studied. In a traditional review session, the instructor presents the material in a lecture or question and answer format (Wieman, Perkins, & Gilbert, 2010). For instance, an instructor may take a few minutes at the start of class to highlight and explain concepts from the previous class period or from the assigned readings.

The instructor's review re-exposes students to the subject matter. This may activate students' recognition of the material and highlight concepts relevant to the current class period, but from a cognitive science perspective does not engage them in more elaborate processing that could improve their learning and understanding.

An alternative approach is to involve students in working with the subject matter. Maxwell, McDonnell, & Wieman (2015) created a two-stage course review for an advanced chemistry class. The researchers developed a quiz that encompassed prerequisite concepts and topics from previous courses. Students first worked individually on the quiz, and then re-took the quiz and discussed their answers in small groups of 3-5 students.

The study found that:
1. Students were more highly engaged than in traditional review sessions.
2. The group discussions and feedback from the instructor helped students improve their understanding of the material and develop more accurate estimates of their knowledge and understanding.
3. The quiz revealed students' misconceptions and important error patterns. Based on the quiz results, instructors were able to target specific concepts for follow up instruction.
4. Instructors were able to reduce the overall review time because they could focus on students' weaknesses rather than review material students already knew.

The study did not include a control group, so we do not know how student performance in the two-stage review compares to a traditional review. There is good reason to believe that the two- stage review does more to enhance student learning because it involves students in two potent learning processes, retrieval practice and self-explanation.

1. [Retrieval practice](). Extensive research has shown that trying to recall previously studied material is an effective learning process. Recall strengthens memory for the material and also creates new connections with the material (Roediger, Putnam & Smith, 2011). A practice quiz in which students solve problems and try hard to remember material is an excellent form of retrieval practice.

2. Self-explanation. Explaining new material to oneself or someone else has a positive effect on learning (Chiu & Chi, 2014; Fiorella & Mayer, 2015). Explaining involves using prior knowledge to interpret new information, making inferences about the meanings of ideas, noticing how ideas are related or not related to one another, noting that you don't understand something, recognizing that you need additional information and so forth. When a person tries to explain a topic they take pieces of information and assemble them into a conceptual model of the information. It is the *process* of explaining that facilitates learning even when the individual is not able to produce a well-developed explanation or conceptual model.

Based on research in the cognitive sciences, we can recommend ways to make review sessions more effective learning experiences.

1. Involve students in retrieval practice with practice quizzes, practice tests, or other types of prompts in which they try to recall what they learned previously.

2. Involve students in explaining the review topics to one another. Prompt students to explain and justify their answers to one another, e.g., a partner or small group.

3. Advise review groups to give one another constructive feedback and work toward understanding the topics.

4. Provide explanatory feedback that highlights the characteristics of well-developed answers and contrasts them with under-developed answers.

5. Promote the perspective that deep understanding of topics typically takes time and students should not expect to understand every concept quickly or all at once.

6. Encourage student effort and participation by emphasizing the relevance of the review to subsequent learning in the course or to the upcoming exam, etc. Promote reviews as opportunities for practice that can help them learn more and perform better in the class.

7. Encourage student effort and participation by making the review session a low stakes activity, e.g., give a small amount of credit for participation. Research on practice testing has found that students engage more actively and like class activities more when they do not have to be concerned about being evaluated for a grade (Pyc, Agarwal, & Roediger, 2014).

Review sessions that incorporate these features are more likely to help students focus on key concepts, reactivate dormant knowledge, relearn material and improve their understanding of subject matter.

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