

Active Learning Methods: 2-5 Minutes

Interactive Teaching and Active Learning Best Practices for Teaching and Learning

Now, let's go through several examples of brief active learning activities that will take between two and five minutes of class time. All of these activities are examples of quick-thinks from the paper by Cooper, et al. called "The Interactive Lecture".

In a compare or contrast activity, students are asked to identify the similarities or differences between two items or concepts. When providing a reorder the steps activity, an instructor may ask the students to place all of the steps of a particular laboratory procedure in the correct order.

In other quick-thinks, students may be asked to provide supporting evidence of a statement, explain a conclusion based on provided data, rephrase an idea in their own words, fix a mistake, or correctly complete a sentence. The last activity, select the best response, is a multiple-choice question in which students are asked to identify the best answer to the question.

In all of these activities, students first work on the activity on their own, discuss their answer with a peer, and then share their answers in a whole-class setting. This type of Think-Pair-Share activity helps to engage students in the learning process.

As I just mentioned, the most effective manner to incorporate in-class concept questions is through the use of Think-Pair-Share activities. In this type of activity, it is important for the instructor to gauge the level of each student's understanding in the class and not just that of the high-performing student who is able to answer the question quickly.

To be most effective, it is important to obtain answers in an anonymous manner to ensure that each student provides his or her own response to the question. In addition, it is important to have a method for the instructor to quickly and accurately gauge the level of understanding of each student in the class.

The best concept questions contain multiple plausible answer choices. These types of questions will generate discussion among students. This will engage students in the course material and promote interactive learning.

By listening to these discussions, the instructor will be able to identify student misconceptions about the course material. It is important to remember that when concept questions, and active learning methods in general, are implemented well in a classroom, students overwhelmingly support their use.

One way of incorporating concept questions and collecting student responses is through the use of "clicker" response technology. "Clickers" are small, remote-like devices on which students can select their answer. Each student's answer is related to a receiver on the instructor's computer. And the number of student responses for each answer choice is displayed for the instructor.

If you choose to use technology in your classroom to collect student responses, be sure to inform your students of the reasons of doing so. While "clickers" are one method of obtaining fast, anonymous responses from your students, there are other methods, as well.

One method is to have students hold up color-coded paper cards to represent their answer. Each card represents a different answer choice. Another alternative to "clickers" is to have students hold up a different number of fingers in front of their chests to indicate their answer. In this case, one finger can represent A, two fingers can represent B, et cetera.

In all of these cases, whether technology or non-technology based, the instructor can easily determine the approximate percentage of each answer by scanning the classroom or computer screen.

In the case of the non-technology methods, each student's answer will remain anonymous to their peers if the students hold up the cards or their fingers in front of them. By providing their answers in this manner, students won't be persuaded to alter their responses based on peer pressure.

Let's try doing this method of feedback using an online, web-based system to collect answers on several concept questions. Navigate to m.socrative.com and join room number 202247. This system lets you provide answers in a web browser on your computer, tablet, or mobile phone.

Writing good concept questions is a difficult task. Let's go through several different types of concept questions. All of these examples will fall under the select the best response category of questions.

The first question is, "When did World War II occur?" a) 1914 to 1918. b) 1939 to 1945. c) 1941 to 1945. or d) 1950 to 1953? Use the online system to provide your answer to the question.

Pause the video now while you answer the question. Go to the online discussion forums to discuss your answers. Pause the video now to discuss the answer.

Now that you have had a chance to discuss the answers, answer the question again in the online system. Pause the video here while you answer the question.

The answer to this question is b) 1939 to 1945. What level of Bloom's Taxonomy does this question represent? Pause the video now while you think about the answer. This question focuses on remembering the particular dates of the Second World War and corresponds to the lowest level of Bloom's Taxonomy.

When designing concept questions, it is important to design thoughtful questions. It is important to be thoughtful about what you ask and why you are asking the question to ensure that the question will help your students attain your desired learning objective. Students overwhelmingly see challenging questions as the most useful for their learning.

Let's answer the second example question now. "If living cells similar to those found on earth were found on another planet where there was no molecular oxygen, which cell part would most likely be absent?" a) cell membrane. b) nucleus. c) mitochondria. d) ribosome. or e) chromosome?

Use the online system to provide your answer to the question. Pause the video now while you answer the question. Go to the online discussion forums to discuss your answers. Pause the video now to discuss the answer.

Now that you have had a chance to discuss the answers, answer the question again in the online system. Pause the video here while you answer the question.

The answer to this question is c) mitochondria. The mitochondria are one type of organelle within cells that are responsible for generating most of the cell's energy in the form of ATP through the process of cellular respiration. What level of Bloom's Taxonomy is this question?

Pause the video here while you think about the cognitive level of understanding that is required to answer this question. This question is at the understand level of Bloom's Taxonomy. Students are required to be able to explain the function of each of the parts of the cell provided in this question and understand that the mitochondria use oxygen to complete their function.

Let's go through another example of a select the best response question. "Consider a drug, HA, that is active only in the deprotonated A minus form. The pKa of the drug is 4.0. And the pH of blood is 7.4. Select the correct statement below." Most of the drug will be in the active A minus form in the bloodstream, most of the drug will be in the inactive HA form in the bloodstream, The ratio of A minus to HA will be approximately 1 to 1 in the bloodstream. Or d) more information is needed to predict the ratio of A minus to HA in the bloodstream.

Think about the answer to the question on your own. And then use the online system to record your answer. Pause the video here while you answer the question. Go to the online discussion forums to discuss your answers.

Pause the video now to discuss the answer. Now that you have had a chance to discuss your answers, answer the question again in the online system. Pause the video here while you answer the question.

The correct answer is a) most of the drug will be in the active form in the bloodstream. The pKa is the point at which the molecule will lose a hydrogen atom. As a result, if the pKa is 4, then the drug, HA, will have lost the hydrogen atom in the bloodstream, which is at pH 7.4. This select the best response question is a great example of a question that can provide essential feedback on how well students understand the concept. The instructor can assess student understanding based on the percentage of correct answers and also by analyzing how quickly students can solve the problem.

Let's go through one last example question now. "Based on research at NASA, what was the approximate net global change in temperature between 1880 and 2000?" a) plus 2 degrees Celsius. b) plus 0.7 degrees. c) plus 0.05 degrees. d) minus 0.05 degrees. Or e) minus 0.7 degrees Celsius?

Think about the answer to the question on your own. And then use the online system to record your answer. Pause the video here while you answer the question. The correct answer to this question is b) plus 0.7 degrees.

I could use this question as an attention getter for a class on global warming, temperature measurements, or the politics of global warming science. In this case, the question serves to engage students in the material that I am about to present and provides motivation for learning the material.

In most of these example questions, we provided prompts for you to implement using a think-pair-share strategy. Data by Smith, et al. demonstrated that peer discussion, when implemented with "clicker" technology to answer in-class concept questions, is effective at improving student performance on the concept questions.

The use of peer discussion is effective, even when all of the students in the small group do not understand the question correctly at first. As a result, when implementing effective concept questions in your own classroom, allow for peer discussion periods following an initial period for students to think on their own.