

Active Learning Methods: 5-20 Minutes

Interactive Teaching and Active Learning Best Practices for Teaching and Learning

Now, let's go through activities that will take longer to implement during class. These longer activities usually take between 5 and 20 minutes of class time. They are either activities that contain long discussions or demonstrations centered around answering multiple-choice or open-ended questions or activities that involve participation of the whole class.

All of these longer activities are usually reserved for concepts that are especially challenging to teach and are formatted to promote whole-class discussion and participation to engage all of the students in the class.

Let's go through an example of a long activity now. This is an example demonstration that could be incorporated into a physics course.

In this demonstration, I have two wooden blocks. They are made out of exactly the same type of wood and are exactly the same length and width. But they vary in their thickness.

One block is twice as thick as the other, the thin block. Now when I tap on the thin block, it makes a specific tone. Let's do this now.

[TAPPING ON THIN BLOCK]

Could you hear it? Now my question is, if I tap on the thicker block, will the tone be higher than, lower than, or the same as the thinner block? 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 discussed your answer with a peer, answer the question again. Pause the video now while you answer the question.

At this point, if I were performing this demonstration in a real classroom, I would ask for students to provide their answers to me and a short explanation of their answer. I would record their answers on the board. It is important to simply write all of the answers, whether they are correct or incorrect, on the board without giving away the answer.

We will skip this step in this online video session. But I encourage you to include this step in your own classrooms when you are implementing long activities such as this one.

Now, let's find out the answer to the question that I posed at the beginning. To remind you, I have two blocks that are the same length and width. They only vary in their thickness. And when tapped, the thin block has a particular tone. Let's tap the thin block now.

[TAPPING ON THIN BLOCK]

OK. Now listen carefully while I tap the thick block.

[TAPPING ON THICK BLOCK]

And again, we'll do both of them.

[TAPPING ON THIN BLOCK]

[TAPPING ON THICK BLOCK]

What did you hear? The thick block has a higher tone than the thin block. The thick block has a higher tone than the thin block by almost a factor of two, because the thick block is stiffer than the thin block.

At this point, I would review the answer with my students. The frequency of the tone is approximately equal to the square root of the stiffness coefficient, k , over the mass, m . The stiffness coefficient is proportional to the thickness of the block cubed.

And the mass is proportional to the thickness of the block. As a result, the frequency is proportional to the thickness of the block. And the frequency of the tone of the thick block is almost twice as high as that of the thin block, because it is twice as thick.

Now that we have completed the demonstration, let's think about the way in which the demonstration was implemented in the classroom. What were the teaching elements of the demonstration? And why was the demonstration performed in this manner? Pause the video now to think about your answers to these questions.

The demonstration was performed in a very specific manner. After introducing the demonstration, students were provided a sufficient length of time to think and then answer the question on their own. Students discussed their answer with a peer and were able to answer the question again.

At this point, the instructor could then collect answers from several students in the classroom and write them down on the board. Then, the actual demonstration was performed. And hopefully, the students had an "aha" moment. At this point, the demonstration was reviewed, and the answer was explained.

The demonstration was performed in this manner for specific reasons. First, I asked for student predictions about the demonstration before students knew the conclusion to the demonstration. In this manner, I hope that students will be more engaged in the demonstration as they are vested in the outcome.

Research by Professor Eric Mazur at Harvard University showed that demonstrations are only effective when students are asked to predict the outcome of the demonstration prior to it being performed. If students were not asked for their predictions, then the demonstration was no more effective than a lecture on the concept at hand.

Second, there is a moment for students to interact with each other and discuss their answers. In this manner, students are participating interactively and are arguing and persuading each other of their answers. Then at the end, I performed the actual demonstration and reviewed the answer to ensure that the students understand the concepts in the demonstration before proceeding with the course content.

Now, I will review two more example long activities to demonstrate other types of activities that can be implemented in your own course. The first activity is an example of an open-ended brainstorm activity. In this activity, students are presented with a particular case study and are asked to think of solutions.

In this case, the head of hammers made by a particular manufacturer are failing. Students will work together in small groups to determine why the hammers are breaking in this particular manner and what can be done to prevent this from happening in the future.

Students will work to determine the necessary information and tests that will need to be performed to make a full recommendation to the manufacturer. After providing sufficient time for students to work on this activity, the instructor can then collect the responses in a group brainstorming session or through short presentations by each group.

This next activity is an example of a whole-class participatory activity. It models vacancy diffusion in a class that is teaching about solid-state diffusion. In solid-state diffusion, two different metals, after being heated, are mixed across a boundary between the two metals.

And there are two types of diffusion that can occur, first, interstitial diffusion, in which diffusion does not occur on a lattice framework and, second, lattice diffusion, in which diffusion does occur on a lattice framework.

To implement this activity in your course, first create a grid on the floor. Divide the class into two equal groups, and assign one half of the class to be one color. And the other half of the class will be a second color.

Each color represents one of the types of atoms that will diffuse. Each student is then assigned a number that will determine when each student can move. And the students are then tasked to find a spot on the lattice.

At the beginning of the activity, all students representing one type of atom are assigned to one side of the grid. And all of the other students, representing the other type of atom, are on the other side of the grid.

As the instructor then calls out the numbers in order, each student has to move to an empty spot or vacancy if there is an open spot as their number is called, Students are allowed to move forward, backward, or side to side, but not diagonally.

The instructor will likely have to call out all of the numbers several times, perhaps even up to 10 times with 40 students. At the end of the activity, the students will have demonstrated vacancy diffusion with their own bodies and see that there is an equal mixing of the two colors, or atoms, across the lattice.