

Workshop Outline

Activity	Time	Interaction Type	Strategy Used

Activity #2 – Active Learning Strategies

Directions for activity:

1. Work with the group seated at your table.
2. Each table will be assigned one strategy outlined in this packet.
3. Read the corresponding material on your assigned strategy (see page numbers below).
4. At your table, discuss and share your experiences and ideas about the strategy for 15 minutes. You may include the following questions/topics:
 - What are the pluses/minuses with this strategy?
 - If anyone in your group has used this strategy, or any variation, describe how it worked.
 - Discuss how you might use this strategy in the future.
 - What variation might you try for the strategy to work for you?
5. Prepare a 5 minute presentation that includes a brief description of the strategy and the experiences and ideas discussed at your table
6. Share the presentation with the whole group.

ACTIVE LEARNING STRATEGIES

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Reader's Theater

Explanation:

The instructor selects text relevant to the day's topic and assigns students in the class to read the text out loud. The text may be a short story, a passage, or a collection of statements. Depending on the length of the selected text and the size of the class all students may be assigned reading responsibilities or only a small fraction of the students may read out loud. If appropriate, the student readers may be encouraged to add drama, flair, or humor to their readings. This technique is particularly helpful for starting discussions, introducing new topics, or shifting gears during a long class period.

Background:

The Reader's Theatre technique is frequently used in elementary schools as an activity that encourages new readers to improve reading confidence, fluency, and comprehension (Martinez et al, 1988). This flexible teaching technique is also used in high schools to develop performance skills and enhance literary studies (Coger and White, 1973).

Benefits:

In an undergraduate science lecture, Reader's Theatre is an efficient way to get many students voices in the classroom and shift speaking responsibilities from the professor to the students. The technique can be useful for getting a variety of viewpoints onto the floor for discussion in a safe and/or efficient manner. For some topics a traditional discussion of volunteers might be difficult to cultivate and/or not reveal the full spectrum of viewpoints because of limited student experiences, lack of knowledge in the field, the controversial nature of the topic, and/or homogeneous demographics. Reader's Theatre is an effective method for encouraging participation, particularly from quiet students who may be shy and/or lack confidence in their own knowledge. Reading a short segment or statement is a relatively low-stakes activity where a quiet student's voice can be heard and/or a student who lacks confidence can make a valuable contribution to the class.

Reader's Theatre has benefits for its readers, but also promotes active listening by the non-readers. The instructor might preface the reading by giving specific instructions that require the non-readers to take notes, identify a stronger/weaker argument, identify an inaccuracy, categorize statements, etc. Given the many distractions inherent in today's classrooms where students are easily lured away from learning by text messages and social media, Reader's Theatre is a small way to encourage and demonstrate why focusing, note taking, and/or careful listening are critical skills for success.

Examples & Variations:

Reader's Theater can be a particularly effective technique on the first day of class to demonstrate the expectation that most of the talking will be done by students. The statements read during Reader's Theater could exemplify a variety of strong and weak discussion contributions and students could then analyze which types of statements facilitated class discussion, which statements were less helpful, and/or how weak statements might be improved with the addition of logic, evidence, etc. The instructor might also choose to shift responsibility for selecting the material read toward the students.

Think-Pair-Share

Explanation:

The instructor poses a question or prompt to the whole class with the explicit instruction that all students are expected to think independently about their answer(s) in silence (and possibly jot notes for themselves). After a minute or so (the duration will depend on the complexity of the prompt), the instructor directs the students to pair up with a nearby or assigned student. In pairs (or trios) the students compare their thoughts. Depending on the prompt, the instructor may guide the pairs to reach a consensus, pick the most convincing response, generate many responses, etc. After the students have talked in pairs the professor gets everyone's attention and asks pairs to share their responses with the full class. The instructor may select pairs by cold calling, asking for volunteers, requesting diverse responses, going around the room, etc. The instructor may also assign students to record the responses.

Background:

The Think-Pair-Share method is frequently attributed to Frank Lyman (1981). It is a tried and true strategy for group learning that has been used very effectively and very widely in postsecondary education (Nilson, 2010).

Benefits:

Think-Pair-Share offers multiple benefits. First, the moment set aside to think quietly communicates that *all* students are expected to think about the issue posed. It thereby reduces the chances that when an instructor poses a question to the class that most students will skip thinking an answer, counting on an eager or attention-seeking classmate to save the day. Similarly, dedicating time to think quietly also allows students who need just an extra moment to organize their thoughts (or gather their courage) a chance of contributing to the discussion. Not only does Think-Pair-Share encourage all students to think, it allows all students to talk. Thus, students experience the advantages of explaining their responses to a peer, vetting their thoughts, and revising. This one-on-one conversation is often much more comfortable for students than if the same question had been posed to the class and a single volunteer response elicited. With every student talking, the "pair" phase inevitably brings a burst of activity to the classroom – this phase alone can provide a quick and important change of pace to a lecture where energy and/or engagement are lagging. Students who might never talk in front of the full class are actively articulating their thoughts to a peer. Finally, in the "share" phase of this activity the instructor randomly calls on student pairs to report out. This "cold calling" sets the important tone that during Think-Pair-Share all students are expected to think and to talk, while minimizing the stress of cold calling an individual student. All pairs have vetted their points before they are raised to the full group, etc.

Examples & Variations:

There are numerous variations of Think-Pair-Share. It may be shortened to become Think-Pair, Pair-Share, or Think-Share. Similarly, students may be asked to share with more than one peer (say first on one side and then on the other). This activity can be readily combined with voting mechanisms (clickers, show of hands, etc.) to make it Think-Pair-Vote. Think-Pair-Share can work particularly well with analyzing data, understanding experiments, and considering interpretations and conclusions.

Roundtable

Explanation:

The instructor asks students to collaborate in small groups on a specific prompt that can generate multiple responses. Students share a single piece of paper that gets passed around their circle rapidly. The goal is to generate as many responses as possible from all members of the group in a defined period of time. A small prize (candy, extra credit point, etc.) may be offered to increase the stakes if desired. Roundtables are often followed by a reporting mechanism in which the professor calls on groups to share their responses. The report-out instructions might ask for no repeated answers, the most predictable answer, the most creative answer, etc. Finally, the instructor may choose to collect the Roundtable papers after the exercise to get a full record of all the small group conversations.

Benefits:

Like many other active learning strategies, Roundtable ensures that every student in the classroom is generating knowledge and contributing to a discussion simultaneously. Roundtables are particularly well suited to brainstorming exercises, but can easily be adapted to other situations where there are multiple responses. Roundtables can quickly transform the energy within a lecture hall because multiple groups are simultaneously engaged in animated conversations or contests.

Examples & Variations:

The Roundtable technique is best suited to brainstorming applications or problems that have multiple reasonable responses, such as experimental results that can have multiple interpretations. This technique can also be used as a way to help students rapidly generate a variety of diverse ideas as potential starting places for assignments or term paper topics. The Roundtable can also be an effective tool for test preparation by prompting the students to list as many key words or concepts that think they should understand to do well on an upcoming exam, etc.

Jigsaw

Explanation:

A class is divided into multiple teams of students. The instructor gives each team a slightly different but well-defined task with clear instructions that each member of the team will do to represent the group at the end of the work. Each team then collaborates on the task, developing expertise in the designated area. The instructor is available for questions and guidance as the groups work to learn their material. Then the instructor rearranges the groups to create new groups that are composed of one member from each of the original groups. Within the new groups each student has designated expertise and is responsible for teaching the information learned in the original group as well as learning the information from the other groups.

Background:

Jigsaw classrooms have long been used as a cooperative and collaborative learning strategy in all levels of education. Originally developed by Aronson for reducing racial conflict and promoting positive relationships across ethnic boundaries (Aronson and Patnoe, 2011), jigsaws have also been adapted as short exercises within undergraduate science lectures and labs (Smith et al., 1991; Perkins and Saris, 2001; Doymus, 2008; Davis-McGibony, 2010).

Benefits:

In a jigsaw exercise the teacher is responsible for structuring the activity with thoughtful prompts and perhaps providing appropriate resources, but students take responsibility for obtaining and conveying new knowledge. The Jigsaw format necessarily requires each student to be both a teacher and a careful listener during the exercise, yet no one student is required to do the front lines digging on all the topics. This exercise also naturally gets every student in the classroom talking and interacting with peers. The rearrangement inherent in the Jigsaw method also promotes interactions with classmates a student might not otherwise encounter as well as provides a burst of physical activity that can help maintain attention.

Examples & Variations:

Jigsaw's process of first developing expertise then sharing it with peers who have different but related expertise can fit into a class period, but may take up the full class time depending on the complexity of the knowledge and depth of the task. Jigsaws are also commonly used in science courses as ways to make primary research articles more approachable. Initial groups may first focus on specific sections (or figures) in a paper, then reconfigure so that each group has at least one member with expertise on each portion of the article. Jigsaw exercises may also fit well with learning activities outside of class. For example, in advance of a Jigsaw activity, an instructor might assign different readings to subsets of students. In this way the first phase of the Jigsaw is independent acquisition of expertise, which allows class time to focus on the collaborative teaching phase of the exercise.

Short Quizzes in Class

Explanation:

The instructor puts a question with a single correct answer out to the whole class and expects all students to respond. Quizzes are typically exercises completed by students working independently, but can readily be adapted into team activities (such as Think-Pair-Share).

Background:

Quizzing during class can accomplish several goals. First, quiz questions can stimulate thought during a lecture, cueing the students to think actively about the material at hand by pulling students out of passive, receptive modes into more engaged and contemplative modes. Quizzes also test comprehension during a lecture, providing real-time feedback to both the student and instructor. The instructor can use the quiz results to spend more time on a topic not well understood or to move on to new material. Similarly, students can use the quiz results to gauge their own understanding in comparison to instructor expectations and peer performance.

Benefits:

Typically when an instructor tosses a question out in a lecture hall, it is answered verbally by a single student who shoots a hand into the air. The bulk of the class might have a very different understanding that is not obvious to the instructor. In contrast, when a question is reconfigured as a quiz, two important benefits emerge. All students are cued to think about the material and the instructor quickly gets a complete view of where the class's knowledge stands.

Examples & Variations:

Quizzes can be implemented in a wide variety of ways from high-tech classroom response systems (a.k.a clickers) to low-tech shows of hands. Clicker systems offer the benefit of rapidly collecting, recording, and displaying responses without individual attribution. Moreover, clickers allow a variety of question formats such as true/false, multiple choice, and numeric responses. Clicker software can sometimes be clunky and the hardware expensive, but they have been used to good effect in many courses ([Wood, 2004](#); [Keller et al., 2007](#); [Crossgrove and Curran, 2008](#); [Bruff, 2009](#)) and new options that allow students to use their cell phones as the responding devices are emerging.

A lecturer does not need a classroom response system to reap the benefits of quizzing in class. Raised hands, mini whiteboards, a folded sheet of paper with A, B, C, D options, or colored index cards can accomplish the same pedagogical goals quite well without the expense or risk of failure inherent to technology ([Lasry, 2008](#); [Fallon and Forrest, 2011](#); [Whitney, 2011](#)). These low-tech alternatives retain the advantage of providing the instructor with quick feedback from the full class.

Finally, in-class quizzes do not need to be oral. They can also be very short (often timed) written exercises that come at the beginning or end of a lecture period. Written quizzes can also be placed in the middle of a lecture as a change of pace or signal closure to a topic. Written quizzes offer the advantages of engaging students in a confidential way with a record of individual performance. Such quizzes do not provide instant feedback and require grading after class.

Minute Papers

Explanation:

In a few minutes of class the instructor asks the students to write a quick response to a question regarding the day's lecture. This exercise is typically done at the end of class and turned in as students exit. Minute Papers prompt students to review the day's lesson before they leave the room. Questions for Minute Papers might include, "what was the take-home message?", "what was the most confusing concept?", "what question could you ask about today's material?", "what will (or will not) stick in your brain from today's class?", or "what points do you want to make sure you retain for the next exam?".

Background:

This technique has been widely used in large and small lecture courses (Harwood, 1996; McKeachie, 1999; Bressoud, 1999; Stead, 2005). As a short writing exercise, Minute Papers provide both the teacher and the students with a quick summary of what was learned in class. Minute Papers also serve as a way to identify points of confusion that might not be immediately obvious.

Benefits:

This technique prompts students to assess the day's lecture before they leave the room. It encourages them to identify key points and questions as a regular exercise. In addition to the well-known benefits of repeating, summarizing, and reviewing information as effective components of learning, minute papers can also decrease the impersonal, unidirectional nature of traditional lecture courses. Through Minute Papers, all students have an accessible opportunity to raise questions or a safe way to admit confusion.

An instructor can use feedback from Minute Papers to assess the effectiveness of the lecture as well as to identify areas that need additional clarification (Angelo and Cross, 1993). When an instructor acknowledges feedback from Minute Papers in subsequent classes, this action not only improves lecture efficacy but can also enhance relationships between the student and professor even with large enrollments.

Examples & Variations:

Minute Papers can be varied in frequency or timing. Some instructors use Minute Papers in every lecture where they also serve as a means of taking attendance. Other instructors employ Minute Papers frequently, but not daily. Writing for a minute or two most often functions as a "cool-down" exercise to close out a lecture, but Minute Papers can certainly be used in the middle of a class period to change pace or signal a topic shift. As well, Minute Papers can be useful for students at the start of a class period as well as a "warm-up" activity (Nilson, 2010). For example, short periods of expressive writing about their anxiety before an exam have been shown to improve exam scores (Ramirez and Beilock, 2011).

Minute Papers may or may not be anonymous. Also, an instructor can choose that Minute Papers be graded or ungraded. Finally, returning the Minute Papers is another instructor choice. Some instructors read Minute Papers but do not return them to their students, while others return Minute Papers so students have their own summaries and questions for their studying.

The material above is an excerpt from: “*Classroom Activities: Simple Strategies to Incorporate Student-Centered Activities within Undergraduate Science Lectures*” by Barbara Lom, Department of Biology and Program in Neuroscience, Davidson College, Davidson, NC

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Rebus and Riddles

1. Johnny's mother had three children. The first child was named April. The second child was named May. What was the third child's name?

2. Solve the puzzle



3. Six drinking glasses stand in a row, with the first three full of juice and the next three empty. By moving only one glass, can you arrange them so empty and full glasses alternate?

4. Solve the puzzle



5. Given these equations, what does 4500 equal?

$$8898=7$$

$$4566=2$$

$$1203=1$$

$$2313=0$$

$$4566=2$$

$$5464=1$$

$$7774=0$$

$$1003=2$$

$$9856=4$$

$$9955=2$$

$$1886=5$$

$$1231=0$$

$$8764=3$$

$$4500=$$

6. Solve the puzzle



7. If you wrote all the numbers from 300 to 400 on a piece of paper, how many times would you have written the number 3?

8. You are in a place called Jack's World and there is only one law. There is a mirror, but no reflection. There is pizza with cheese, but no sausage. There is pepper, but no salt. There is a door, yet no entrance or exit. What is the law?

9. Solve the puzzle



10. A bat and ball cost \$1.10. The bat costs one dollar more than the ball. How much does the ball cost?

11. Solve the puzzle.



12. What letter comes next in the following sequence? D R M F S L T _

13. What number comes next in the following sequence? 2 4 8 10 20 _

14. Solve the puzzle.



15. Some months have 30 days, some months have 31 days: how many have 28?

16. Solve the puzzle.

