The 4-Minute Summary: Helping students recall, recap and explain the big picture... and much more!

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Abstract
Actively engaging students during a lecture class can come through many formats. The 4-Minute Summary is a versatile pedagogy that can be readily applied to any class format (e.g., traditional, flipped), any class size, and any content. Students benefit by engaging with peers while at the same time recapping and recalling content in their own words. The 4-Minute Summary allows students to (1) engage with peers, (2) engage with content, (3) recap/recall content in their own words, (4) practice speaking the content and (5) provide a venue for questions to be answered. Luckily, students also enjoy using 4-Minute Summaries as a way to check their understanding while interacting with their peers.

INTRODUCTION
Literature on learning and the brain confirms that humans have a limited short-term memory capacity (1). As a result, faculty are encouraged to break up lectures into smaller units, often no longer than 10 minutes (2). Advocates of active learning suggest “bookending” these lecture segments with opportunities for student engagement (3). While a plethora of strategies exist for these times (e.g., Memory Matrix, Minute Paper, Muddiest Point, Pro/Con Grid, Student-Generated Test Questions, etc., 4), I wanted to use a pedagogy that allowed students to (1) engage with peers, (2) engage with content, (3) recap/recall content in their own words, (4) practice speaking the content, and (5) provide a venue for questions to be answered. Building on the “turn to your neighbor” approach (3), I created the 4-Minute Summary to capitalize on the fact that students in my class work in collaborative learning teams. This active learning approach can be easily used in large or small, introductory or upper-level, majors or non-majors courses. For an example of how this technique can be used, please see my CourseSource Lesson article “Does it pose a threat? Investigating the impact of Bt corn on monarch butterflies”.

DESCRIPTION OF APPROACH
In my class, students work in teams of 4 students. At the beginning of the semester, each student in the team is assigned a number (1-4) and asked to write their number down and remember it. Students sit with their collaborative group during every class. After 10 to 15 minutes of instruction or group problem solving, I prompt students to complete the 4-Minute Summary by projecting a list of 4 questions/statements. Each question/statement is numbered 1-4, and students are expected to answer the question or respond to the statement that is associated with their number. The goal is for them to summarize the answer to their question out loud, in as much detail as possible, without referencing their notes. Each student takes 1 minute to complete their summary and then the next person proceeds with answering his or her question. For example, student #1 will explain the answer to question #1. Then, student #2 will talk about question #2. This process continues to student #4. If the 4 answers take less than 4 minutes, students can ask each other questions to clarify specific answers, help their peers fill in the details, or get help from me or TAs in the classroom. Typically, before starting the timer, I give students a few moments to think about their question and write down a few notes about what they wish to say. However, this additional time adds 30-60 seconds to the activity.

During a typical class day, it is possible that one or more team members may be missing. If that is the case, teams are instructed to work together to answer the unassigned question(s). For teams that have only three assigned members, the team members rotates answering the 4th question. For example, in the first 4-Minute Summary of the day, person #1 answers question #4. For the next 4-Minute Summary, person #2 answers the 4th question. The next time teams are given a 4-Minute Summary (e.g., the next class day), the 3rd person answers the question, and then the order repeats.

While I typically arrange the questions for the 4-minute summary from lower-level to higher-level along Bloom’s taxonomy, I am mindful to change the order of the student numbers, such that student #1 is not always answering...
knowledge and comprehension questions. For example, I might list the first 4-minute summary questions in order (e.g., person 1-4), but the second 4-minute summary I would list in a different order (e.g., 4-3-2-1 or 2-3-4-1). Students get used to the varied numbering system with repetition.

USES OF THE 4-MINUTE SUMMARY
In a typical class session I may use one to three different 4-Minute summaries. For example, I might start class with a 4-Minute summary review of the prior class session. After 45 minutes of in-class time (e.g., lecture, discussion, group work, etc.), I may insert a 4-Minute summary to pause before transitioning in a new direction. Finally, I could also conclude class by having students complete a 4-Minute summary the wrap up the day or revisit the learning outcomes for the class time.

The uses of the 4-Minute Summary are nearly endless. For example, I have used the 4-Minute summary in the following ways:

• At the beginning of class as a review of the previous day's content
• At the beginning of class as a review of pre-reading content
• In between “mini-lectures” as a summary (low-level Bloom's questions)
• In between “mini-lectures” as a critical thinking challenge (high-level Bloom's questions)
• In between “mini-lectures” as a prediction
• In between in-class activities as a summary
• In between in-class activities as a foreshadowing of where we are going next
• In between independent work as a chance to students to check in and self-assess
• During class to read a figure or model
• After completing an in-class assignment as a chance to review and self-assess
• After a class session to review content
• At the end of class to summarize responses to the learning objectives for the day

INCLUSIVITY
One of the biggest assets of the 4-Minute Summary is that it engages every student in the classroom. Since each student has a number and is a part of the group, each individual will contribute to the understanding of the course content through the discussion. By repeatedly bringing together four diverse voices in the student team, students learn to listen to one another, value the input of others, and begin to see the value of many voices in the learning process and in the scientific community.

ASSESSMENT
A key to the success of the 4-Minute Summary is accountability, and there are many ways to assess students’ contributions to a 4-Minute Summary. For example, during the summary time, I walk around the classroom visiting as many student groups as possible. As I walk, I can overhear conversations and can quickly gauge if students are on topic and the level of accuracy of their summary response. Following the summary, I often follow up by randomly calling on groups to share their discussion, a strategy I learned from Tammy Long and Diane Ebert-May at Michigan State University while I was a graduate student. The group that is called upon then summarizes their discussion for the benefit of the entire class. Alternatively, I may emphasize one question in particular, perhaps a question that was designed to lead into where we are going next, and each group is asked to report its response to that question. Since the 4-Minute Summary is designed to provide formative assessment, I can adjust the direction I was planning to go next in light of their responses. When I am teaching in a SCALE-UP (5) classroom, I often ask students to write their answers as a short 1-sentence summary on the group’s white board space. Then, I can quickly scan their responses to see if they are on track. Even better, they can also scan the answers of other groups. Finally, I can follow up the 4-Minute Summary with a clicker question or two that enables quick formative assessment of each student’s learning, thus holding each person accountable for all four answers.

TIPS FOR SUCCESS
The first time you introduce a 4-Minute Summary, it might be helpful to introduce the structure of the approach by giving students four icebreaker questions. Initially, you’ll want to allow a few extra minutes (2-3) as they learn how to transition into and out of a 4-Minute Summary. Within a week of using the approach, you can streamline the transition time, especially if teams are sitting near one another. Particularly in the beginning, a countdown clock is helpful to keep you and your students on time.

Regular use of the 4-Minute Summary will help students become even faster at the transition, and will also allow you to have consistent time-points where you can easily check their conceptual understanding throughout your class session. For example, in a 70-minute class session, I may use three 4-Minute Summaries, in combination with clicker questions, and other active learning strategies.

No matter how frequently I use the 4-Minute Summary, students ask me to use them more often when they provide feedback about the course during or at the end of the semester. They note how helpful the summaries are to their learning. One student in particular commented that the summaries helped her feel more confident in talking about biology outside of the classroom. She noted that the daily speaking, summarizing, and using the terminology left her feeling capable of talking about the science she was learning.

SUPPLEMENTAL MATERIALS
• Supplemental File S1. The 4-Minute Summary-Examples

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REFERENCES