



Karen Rogers shows how to use spaced learning and interleaving.

## Kansas Teacher Examples

Everyone knows that the longer you wait to use old information you once learned, the more likely you are to forget it. That is why teachers use review activities—so students don't forget what they've learned. When a review takes place several weeks after the initial learning experience, the information is harder to retrieve; but once it is retrieved, it sticks better and lasts for a longer period of time.

Research has shown that student learning increases when students are re-exposed to information they have previously learned (spaced practice), and the re-exposure, or review, takes place weeks or even months after the initial learning experience (interleaving). The harder students have to work to retrieve old information, the more retrievable it will be at a later time.

Here's how **Karen Rogers** does it in her Science classes. After teaching the subject matter, wait at least two weeks (the longer the better). Then use a review activity with the key content questions you want students to remember. Ask students the questions and let them dig deep to retrieve the answers.

Be sure to go over the questions and answers. Correct any mistakes. Tests show that if mistakes are not corrected during the review, they will continue to make the same mistakes on the summative test.

Don't get discouraged if it seems like students have forgotten everything they once knew during the review activities. This is part of the process. Bringing old information out of mental storage and back into the working memory increases the chance of it entering and staying in the long term memory.

### 1. Space Learning Over Time

- ♦ Complete a comprehensive review every 6–9 weeks. It could be a worksheet, flashcards with questions and answers, a game, or a practice quiz.
- ♦ Add bonus or “do you remember” questions of old material on current tests.
- ♦ Give cumulative tests or finals.

### 2. Interleave Worked Example Solutions with Problem-Solving Exercises

- ♦ Metric conversion problems
- ♦ Genetics problems
- ♦ Energy transfer problems

### 3. Combine Graphics with Verbal Descriptions

- ♦ Take time to discuss the pictures and graphics in the textbook or a PowerPoint presentation. Discuss the illustration and what it means.
- ♦ Use diagrams for biological processes such as photosynthesis and cellular respiration. Discuss each step in the diagram and what it means.
- ♦ Use video clips with both verbal explanations and visuals.

### 4. Connect and Integrate Abstract and Concrete Representations of Concepts

- ♦ Draw a cartoon-like picture of the cell membrane then discuss methods of homeostasis (cell transport).
- ♦ Make a model of DNA then teach DNA replication and cell division.
- ♦ Observe obvious human traits (tongue rolling, widow's peak) then study genetics.
- ♦ Act out biological processes: photosynthesis, energy flow through the biosphere, or protein synthesis (transcription/translation).
- ♦ Use lab activities to demonstrate concepts such as plant movement (tropism), diffusion, or organic molecules (tests for sugar, starch, proteins).



## Kansas Teacher Examples (continued)

### 5. Use Quizzes to Re-Expose Students to Key Content

- ♦ Use quizzes before teaching and after, encourage students to guess rather than leave the answers blank.
- ♦ Use fill-in-the-blank or short answer questions as opposed to multiple choice.
- ♦ Give quizzes over old material (with feedback) to reinforce learning.
- ♦ Use a computer program ([quia.com](http://www.quia.com) or other) with test questions that provide immediate feedback.