1. Begin a lesson with a short review of previous learning: Daily review can strengthen previous learning and can lead to fluent recall.

Research findings

Daily review is an important component of instruction. Review can help us strengthen the connections among the material we have learned. The review of previous learning can help us recall words, concepts, and procedures effortlessly and automatically when we need this material to solve problems or to understand new material. The development of expertise requires thousands of hours of practice, and daily review is one component of this practice.

For example, daily review was part of a successful experiment in elementary school mathematics. Teachers in the experiment were taught to spend eight minutes every day on review. Teachers used this time to check the homework, go over problems where there were errors, and practice the concepts and skills that needed to become automatic. As a result, students in these classrooms had higher achievement scores than did students in other classrooms.

Daily practice of vocabulary can lead to seeing each practiced word as a unit (i.e., seeing the whole word automatically rather than as individual letters that have to be sounded out and blended). When students see words as units, they have more space available in their working memory, and this space can now be used for comprehension. Mathematical problem solving is also improved when the basic skills (addition, multiplication, etc.) are overlearned and become automatic, thus freeing working-memory capacity.

In the classroom

The most effective teachers in the studies of classroom instruction understood the importance of practice, and they began their lessons with a five- to eight-minute review of previously covered material. Some teachers reviewed vocabulary, formulae, events, or previously learned concepts. These teachers provided additional practice on facts and skills that were needed for recall to become automatic.

Effective teacher activities also included reviewing the concepts and skills that were necessary to do the homework, having students correct each others' papers, and asking about points on which the students had difficulty or made errors. These reviews ensured that the students had a firm grasp of the skills and concepts that would be needed for the day's lesson.

Effective teachers also reviewed the knowledge and concepts that were relevant for that day's lesson. It is important for a teacher to help students recall the concepts and vocabulary that will be relevant for the day's lesson because our working memory is very limited. If we do not review previous learning, then we will have to make a special effort to recall old material while learning new material, and this makes it difficult for us to learn the new material.

Daily review is particularly important for teaching material that will be used in subsequent learning. Examples include reading sight words (i.e., any word that is known by a reader automatically), grammar, math facts, math computation, math factoring, and chemical equations.

When planning for review, teachers might want to consider which words, math facts, procedures, and concepts need to become automatic, and which words, vocabulary, or ideas need to be reviewed before the lesson begins.

In addition, teachers might consider doing the following during their daily review:

- Correct homework.
- Review the concepts and skills that were practiced as part of the homework.
- Ask students about points where they had difficulties or made errors.
- Review material where errors were made.
- Review material that needs overlearning (i.e., newly acquired skills should be practiced well beyond the point of initial mastery, leading to automaticity).

10. Engage students in weekly and monthly review: Students need to be involved in extensive practice in order to develop well-connected and automatic knowledge.

Research findings

Students need extensive and broad reading, and extensive practice in order to develop well-connected networks of ideas (schemas) in their long-term memory. When one's knowledge on a particular topic is large and well connected, it is easier to learn new information and prior knowledge is more readily available for use. The more one rehearses and reviews information, the stronger these interconnections become. It is also easier to solve new problems when one has a rich, well-connected body of knowledge and strong ties among the connections. One of the goals of education is to help students develop extensive and available background knowledge.

Knowledge (even very extensive knowledge) stored in long-term memory that is organized into patterns only occupies a tiny amount of space in our limited working memory. So having larger and better-connected patterns of knowledge frees up space in our working memory. This available space can be used for reflecting on new information and for problem solving. The development of well-connected patterns (also called “unitization” and “chunking”) and the freeing of space in the working memory is one of the hallmarks of an expert in a field.

In the classroom

Many successful programs, especially in the elementary grades, provided for extensive review. One way of achieving this goal is to review the previous week's work every Monday and the previous month's work every fourth Monday. Some effective teachers also gave tests after their reviews. Research has found that even at the secondary level, classes that had weekly quizzes scored better on final exams than did classes with only one or two quizzes during the term. These reviews and tests provided the additional practice students needed to become skilled, successful performers who could apply their knowledge and skills in new areas.

Thus, research on cognitive processing supports the need for a teacher to assist students by providing for extensive reading of a variety of materials, frequent review, and discussion and application activities. The research on cognitive processing suggests that these classroom activities help students increase the number of pieces of information in their long-term memory and organize this information into patterns and chunks.