

Question 1-11 are based on the following passage.

This passage is adapted from Steven C. Pan, “The Interleaving Effect: Mixing It Up Boosts Learning.” ©2015 by Scientific American.

We’ve all heard the adage: practice makes perfect! In other words, acquiring skills takes time and effort. But how exactly does one go about learning a complex subject such as tennis, calculus, or how to play the violin? An age-old answer is: practice one skill at a time. A beginning pianist might rehearse scales before chords. A tennis player practices the forehand before the backhand. Learning researchers call this “blocking,” and because it is commonsensical and easy to schedule, blocking is dominant in schools and training programs.

However, another strategy promises improved results. Enter “interleaving,” a largely unheard-of technique that is capturing the attention of cognitive psychologists and neuroscientists. Whereas blocking involves practicing one skill at a time before the next (for example, “skill A” before “skill B” and so on, forming the pattern “AAABBBCCC”), in interleaving one mixes, or interleaves, practice on several related skills together (forming for example the pattern “ABCABCABC”). For instance, a pianist alternates practice between scales, chords, and arpeggios, while a tennis player alternates practice between forehands, backhands, and volleys.

Given interleaving’s promise, it is surprising then that few studies have investigated its utility in everyday applications. However, a new study by cognitive psychologist Doug Rohrer takes a step towards addressing that gap. Rohrer and his team are the first to implement interleaving in actual classrooms. The location: middle schools in Tampa, Florida. The target skills: algebra and geometry.

The three-month study involved teaching 7th graders slope and graph problems. Weekly lessons were largely unchanged from standard practice. Weekly homework worksheets, however, featured an interleaved or blocked design. When interleaved, both old and new problems of different types were mixed together. Of the nine participating classes, five used interleaving for slope problems and blocking for graph problems; the reverse occurred in the remaining four. Five days after the last lesson, each class held a review session for all students. A surprise final test occurred one day or one month later. The result? When the test was one day later, scores were 25 percent better for problems trained with interleaving; at one month later, the interleaving advantage grew to 76 percent.

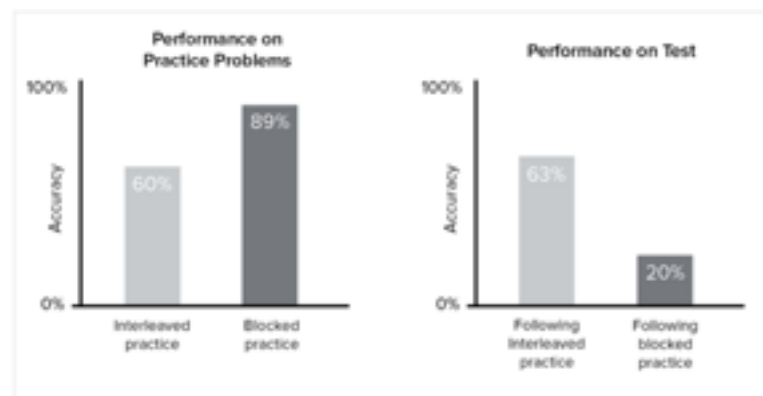
These results are important for a host of reasons. First, they show that interleaving works in real-world, extended use. It is highly effective with an almost ubiquitous subject, math. The interleaving effect is long-term and the advantage over blocking actually increases with the passage of time. The benefit even persists when blocked materials receive

50 additional review. Overall, the interleaving effect can be strong, stable, and long-lasting.

55 Researchers are now working to understand why interleaving yields such impressive results. One prominent explanation is that it improves the brain’s ability to tell apart concepts. With blocking, once you know what solution to use, the hard part is over. With interleaving, each practice attempt is different from the last, so rote responses don’t work. Instead, your brain must continuously focus on searching for different solutions. That process can improve your ability to learn critical features of skills.

60 A second explanation is that interleaving strengthens memory associations. With blocking, a single strategy, temporarily held in short-term memory, is sufficient. That’s not the case with interleaving—the correct solution changes from one practice attempt to the next. As a result, your brain is continually engaged at retrieving different responses and bringing them into short-term memory.

65 Both of these accounts imply that increased effort during training is needed when interleaving is used. This corresponds to a potential drawback of the technique, namely that the learning process often feels more gradual and difficult at the outset. However, that added effort can generate better, longer-lasting results.



Data in the figures show results of an experiment where college students learned to solve multiple types of problems, and practice problems were either blocked or interleaved. Students were then tested one week later on their ability to solve those same types of problems.

Adapted from Doug Rohrer and Karl Taylor, "The Shuffling of Mathematics Problems Improves Learning" ©2007 by Springer Science + Business Media Inc.

1

Over the course of the passage, the main focus shifts from

- A) an evaluation of a popular learning strategy to a consideration of several lesser-known but potentially more effective strategies.
- B) a presentation of experts' opinions on two learning strategies to an argument based on the author's own opinion.
- C) an explanation of two learning strategies to a discussion of a study that shows the benefits of one strategy over the other.
- D) a description of the learning strategies traditionally used by musicians and athletes to a recommendation to employ an alternative strategy.

2

The main effect of the words "adage" (line 1) and "age-old" (line 4) is to

- A) emphasize the prevalence of certain assumptions about learning.
- B) reveal that a method of learning has been extensively researched on a method of learning.
- C) highlight the reliability of a commonsense approach to learning.
- D) suggest that a style of learning is the subject of ongoing debate.

3

In the second paragraph (lines 11–22) the references to the pianist and the tennis player primarily illustrate

- A) the most common technique used to teach complicated skills.
- B) the process of interleaving in specific contexts.
- C) the difficulties associated with mastering complex subjects.
- D) the skepticism teachers exhibit towards the interleaving method.

4

It can reasonably be inferred from the passage that most researchers interested in skills acquisition are

- A) unconcerned with the relevance of interleaving to people's routine activities.
- B) focused on how interleaving improves athletes' performance.
- C) intent on examining the function of blocking within an educational setting.
- D) undecided about whether interleaving is an effective alternative to blocking.

5

Which choice provides the best evidence for the answer to the previous question?

- A) lines 7–10 ("Learning . . . programs")
- B) lines 14–19 ("Whereas . . . ABCABCABC")
- C) lines 19–22 ("For . . . volleys")
- D) lines 23–24 ("Given . . . applications")

6

As used in line 53, "yields" most nearly means

- A) surrenders.
- B) slows.
- C) rewards.
- D) produces.

7

The author of the passage would most likely agree with which perspective on interleaving?

- A) It is more beneficial when an individual wants to learn numerous unrelated skills than when an individual wants to learn several related skills.
- B) It may demand more time and exertion than other approaches to learning but is likely to have a more valuable outcome.
- C) If it is applied consistently it can train the brain to distinguish between relevant and irrelevant information.
- D) It may require more studies on its effectiveness before neuroscientists recommend it be used in classroom instruction.

8

Which choice provides the best evidence for the answer to the previous question?

- A) lines 49–50 ("The benefit . . . review")
- B) lines 53–56 ("One . . . over")
- C) lines 62–65 ("With . . . next")
- D) lines 69–73 ("This . . . results")

9

According to data in the figures, what was the average percent accuracy of students' performance on practice problems when the problems were interleaved?

- A) 20
- B) 60
- C) 63
- D) 89

10

Data in the figures indicate that on average, students were most accurate at solving

- A) practice problems that were blocked.
- B) practice problems that were interleaved.
- C) problems on a test following blocked practice.
- D) problems on a test following interleaved practice.

11

Data in the figures best support which idea about interleaving presented in the passage?

- A) Interleaving can be beneficial even when it is used to reinforce skills that were mastered through blocking.
- B) Interleaving may enhance learning by helping the brain to distinguish between concepts.
- C) Interleaving is generally less well-known as a learning strategy than is blocking.
- D) Interleaving appears to boost a person's retention of practiced skills.