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Can the right study strategy help you tackle life's challenges?

Think back to the first time you drove a car. How did you feel then? Excited? Happy? A little nervous? Driving is a different experience for each of us, based on our car, our mental state and our risk-taking habits, as well as our familiarity with our location. Still, our first days on the road share one common denominator. You get behind the wheel, and are immediately faced with challenges you haven't seen before. In shaky circumstances like these, we tend to reach for prior knowledge to find a foothold. Does this remind us of something we learned in driver's ed? Could techniques we practiced earlier apply now?

When you take information you've learned and use it in a new situation, you're practicing a type of problem-solving that scientists call information transfer. Most of us rely heavily on information transfer to get through our day-to-day lives. In our fast-paced world, every day heaps fresh challenges on our plate – many of which we can solve by using prior knowledge in creative ways. However, information transfer isn't easy. Doing it successfully requires us to both remember things we've learned and imagine how they could be useful in a new situation. Cognitive scientists want to know if studying the right way can help us later apply our knowledge to unfamiliar problems.

While cognitive scientists have conducted extensive research on how we can improve at rote memorization tasks, we know far less about strategies that could help us do information transfer more successfully. Our research aims to fill this knowledge gap. Specifically, we compared how effective two different study strategies were for information transfer. The first is retrieval practice, which involves calling up information from memory. If you quiz yourself on vocabulary words using flashcards, you're doing retrieval practice. The second is restudying – the approach of re-reading information you've already learned.

People who use retrieval practice to study information they've learned perform better on rote memorization tasks. However, in general, college students seem to prefer restudying. In a 2009 survey of 177 college students, over 80% used restudying to prepare for exams. In contrast, only around 10% engaged in retrieval practice. Many college tests require students to apply information they've learned to new problems. Does the above trend mean college students have found that restudying can help us do information transfer? Or, is retrieval practice a better study method for both rote memorization and information transfer? Our experiment set out to examine exactly these questions.

We completed our study with undergraduates at Dartmouth College. Our subjects completed all experiment exercises on computers in the College's Cognition and Education Lab. To test students' learning, we first taught them about a "zombie density gap"; all students were shown a 5 x 5 grid with squares colored different shades of green. Subjects were told that the grid represented a town, and – the darker the square – the more zombies were present in that particular

spot. All students spent the first round of the experiment learning the map; for each square, subjects were given 6 seconds to correctly identify its color and 2 seconds to stare at it. Figure 1 contains a visualization of this exercise.

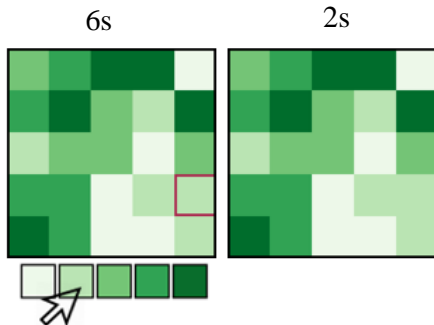


Figure 1 – Above is the zombie density map that subjects learned. They were told that, the darker the square, the more zombies were present there.

From there, students were randomly assigned to study the map using restudying or retrieval practice. Subjects in the restudying group repeated the above procedure four times, looking at every individual square in the map. Students in the retrieval group were provided with a blank version of the grid, and had to identify the color of each square. They repeated this exercise four times.

24 hours later, all subjects were tested with an information transfer problem. They had spent a great deal of time learning the zombie density map. Now, they were shown grids that were nearly blank, but for a pathway of orange squares tracing from one end to another. Students were told that these grids reflected routes through the zombie map; their challenge was to rank the routes, based on which ones most minimized zombie contact. Subjects had to rank 12 sets of six routes each. For each set, participants were expected to drag and drop the routes into the correct order. Figure 2 contains a visualization of this exercise.

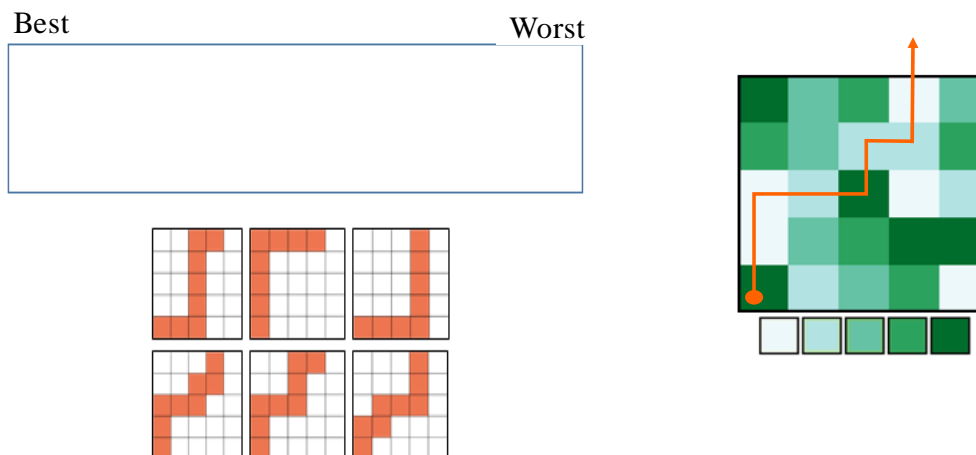


Figure 2 –The image on the left reflects the information transfer task that participants were asked to perform. Among the six routes pictured, the one in the bottom-left corner minimizes zombie contact; the image on the right shows a version of the zombie map with this route running through it.

We found that subjects who used the retrieval method of studying were far more likely to answer the question correctly. How can we use this finding in our day-to-day lives? If you learn information, and believe you'll need to apply it in unfamiliar situations, it'll likely help to make retrieval your main study strategy. For example, if you're currently learning to drive, you might try finding an isolated parking lot and practicing, forcing yourself to call up knowledge from memory. In contrast, simply reading and re-reading instructions from the manual might not help much. Overall, retrieval practice appears to be a promising approach for grappling with the unexpected challenges that inundate us every day.