Retrieval Practice

retrievalpractice.org

Early Childhood

HOW TO IMPLEMENT RETRIEVAL-BASED LEARNING IN EARLY CHILDHOOD EDUCATION

Lisa K. Fazio, Ph.D.

Pooja K. Agarwal, Ph.D.

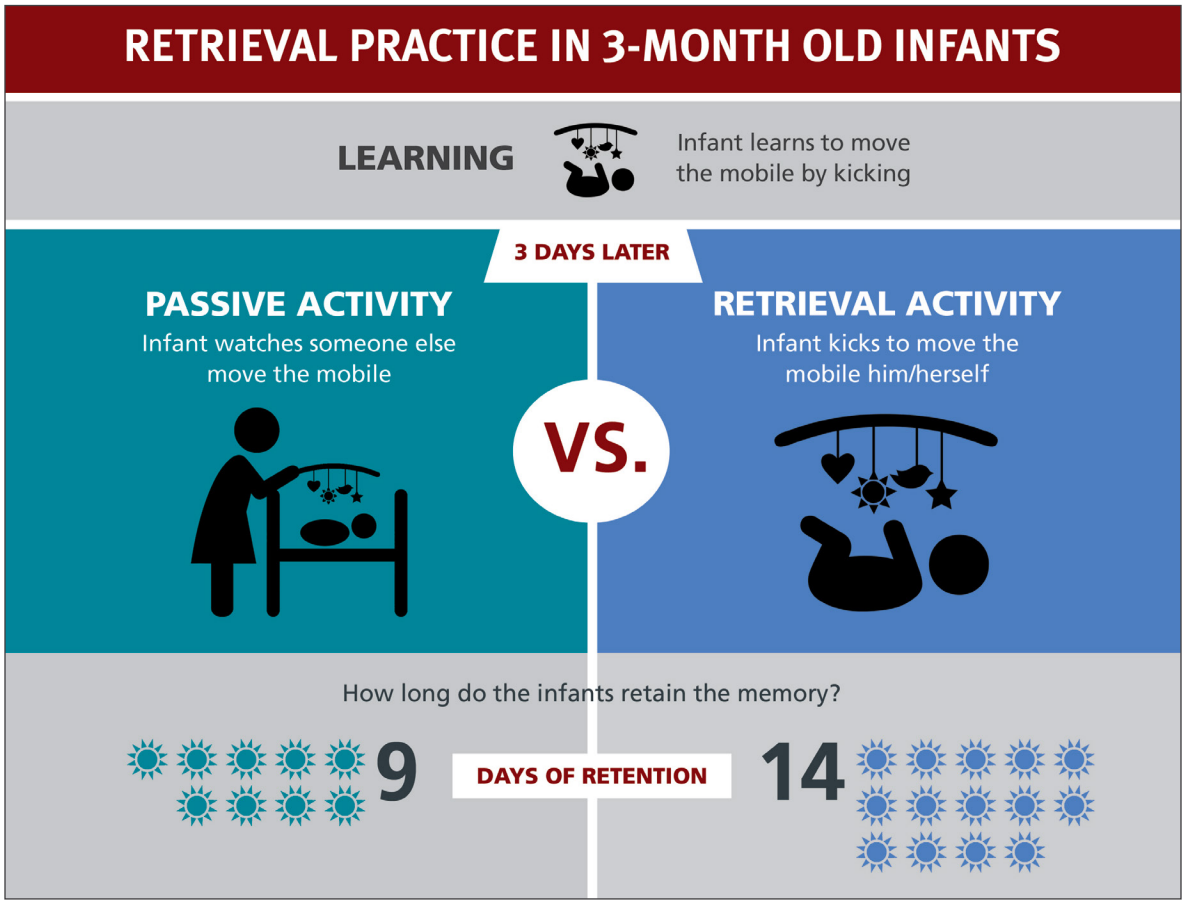
VANDERBILT UNIVERSITY®

WHAT IS RETRIEVAL-BASED LEARNING?

One of the best ways to promote long-lasting learning is to have students retrieve key concepts from memory. Activities such as brain dumps, flashcards and quizzes all require students to recall information and are all effective learning activities. Importantly, these retrieval-based learning activities improve learning more than activities that do not require retrieval such as rereading a text, creating a concept map or hearing a summary of the lesson. Retrieval-based learning also promotes learning and transfer in a variety of domains, including STEM subjects, social sciences, and foreign languages.

The benefits from retrieval practice are well established for both adolescents and adults, in the laboratory and in the classroom. But do younger children also benefit from retrieval practice? Based on emerging literature for preschool and elementary school students, **there is clear evidence that retrieval practice improves learning in children**, starting in infancy. Retrieval practice helps preschoolers learn the names of stuffed animals,[1] improves 2nd graders' spelling performance,[2] and boosts 3rd graders ability to learn the meaning of new vocabulary words.[3] In addition, asking children questions about previously experienced events (e.g., a recent magic show or classroom workshop) improves their memory for the experience.[4, 5]

In fact, even infants benefit from retrieval practice. Three-month-olds who learn how to make a mobile move by kicking their legs will remember the action for 14 days if they get to retrieve the memory and practice the activity 3 days after learning. But, they only remember how to make the mobile move for 9 days if they simply watch someone else move the mobile on day 3.[6] Similarly, toddlers who are taught new action sequences (e.g., take a clown toy out of the chest, put it in a rocking chair, and rock it) remember more actions 12 weeks after learning if they have a chance to retrieve the actions during week 2 instead of watching a video of the actions.[7]



These are just a few demonstrations of children benefiting from retrieval-based learning early in life and the benefits occur for a wide age range of children. Here are more specific findings based on cognitive science research:

- Kindergartners better learn the locations of objects following retrieval practice.[8]
- Third graders who read about the sun remember more of the information one week later when they answered questions about the text compared to when they reread the passage.[9]
- Fifth graders better remember science concept definitions following retrieval-based learning.[10]

All of these examples show that younger children, just like adolescents and adults, benefit from opportunities to retrieve information from memory.

HOW CAN I ADAPT RETRIEVAL-BASED LEARNING FOR CHILDREN?

While retrieval-based learning can be beneficial for students of all ages, some adaptations will help ensure the benefits for younger children.

Provide scaffolding to help young children remember information during retrieval practice. When children do not benefit from retrieval-based learning, it is often because they were unable to retrieve any of the relevant information. By scaffolding their recall, teachers can help students to recall more information. For example, instead of asking broad questions like, "What do you remember about sloths?", teachers can provide additional prompts (e.g., "What do you remember about how sloths move? or "What do you remember about what sloths eat?").

In one example, when 4th graders were asked to remember as much as they could from a science passage they had just read, the students were only able to recall 7% of the key ideas from the passage and retrieval practice was not beneficial. However, when the students were given specific questions about the passage (e.g. "Fog is made of what type of cloud?" and "Describe the shape and color of stratus clouds."), they were able to complete the activity and the retrieval practice increased their later memory for the information.[11]

Provide feedback to correct errors and solidify correct recall. Children of all ages benefit from feedback during retrieval-based learning. For example, feedback helps second graders to correct errors made on an initial multiple-choice test and increases fifth graders' memory for science definitions.[12] Feedback is especially important when children are unable to retrieve the correct information. Trying to retrieve information, but failing, can still be useful if students receive feedback. Numerous studies with adults show that guessing incorrectly and then being told the correct answer is more beneficial than simply studying the correct answer. Recent evidence suggests that the same is true with children. Both kindergartners and second graders benefited from guessing incorrectly before being told the correct answer. Preschoolers saw no benefits, but they were also not harmed by their incorrect responses.[13]

While it can be useful, feedback is not necessary for children to learn from retrieval practice. Children show benefits from retrieval-based learning, even without feedback, as long as the students are able to retrieve some correct information during retrieval practice.

HOW CAN I IMPLEMENT RETRIEVAL-BASED LEARNING IN THE CLASSROOM?

Desirable Difficulties

When deciding how to use retrieval-based learning with elementary school students, it can be useful to think through the idea of "desirable difficulties." Desirable difficulties are activities that are effortful and may cause students to struggle, but they improve long-term learning of the information. Retrieval-based learning is a great example of a desirable difficulty – it is most effective when students have to struggle to remember the information, but they are still able to do so. Students learn less when the retrieval is very easy or very difficult. The key is to aim for the "sweet spot" when retrieval is challenging, but successful.

As we mentioned above, broad open-ended questions (e.g., "What have we learned about the solar system?") can be difficult for younger children and may make retrieval practice too difficult. However, it is also possible to make retrieval practice too easy. Multiple studies have shown that children benefit more from retrieval practice when it occurs after they have forgotten some of the information. Thus, asking the students to recall how to multiply fractions one day or one week after the lesson will be more effective than having them recall it immediately after learning the information.

Cognitive-Processing Language

More broadly, "teacher talk" that includes retrieval practice, strategy suggestions and questions that make students think about their own learning can be very beneficial for young learners. Described as "cognitive-processing language" by researchers, exposure to this type of teacher talk improves students' memory abilities and their classroom learning. Examples of cognitive-processing language include deliberate memory demands ("Who knows the first step we take when building a new structure?"), strategy suggestions ("If you are having trouble thinking of ways to connect the wheel and axle, you can look at the diagram to help you."), and requests for students to think about their thinking ("How did you figure out which pieces you would need to build a sturdy structure?"). This cognitive-processing language seems to be particularly important for students' ability to strategically solve problems. First-graders in classrooms with frequent cognitive-processing language were more likely to use complex memory strategies at the end of the year than students in classrooms that were low in cognitive-processing language. Also, 1st and 2nd graders in an afterschool program learned more strategies for building Lego cars when they were taught using high levels of cognitive-processing language.[14, 15]

CONCLUSIONS

Retrieval-based learning is a powerful tool for increasing student learning. While most of the research has been done with adolescents and adults, recent work suggests that younger children also benefit from retrieval-based learning. In fact, even infants benefit from retrieval! Younger children may struggle to retrieve information in response to broad questions, so teachers should scaffold retrieval by asking more specific questions. But, resist the temptation to make the task too easy because some struggle is useful. The key is to make retrieval practice challenging, but successful. In addition, providing feedback (whether formal or informal) is a great way to ensure that all children, not just those who were able to retrieve the correct information, benefit from retrieval practice. Overall, retrieval practice is an effective way to boost learning for students of all ages.

For research, resources, and tips, visit **retrievalpractice.org**

Retrieval Practice
retrievalpractice.org
ask@retrievalpractice.org

@RetrieveLearn
/RetrievalPractice