Making It Stick: Research-Validated Practice Procedures

— Anita Archer —
About CDL

CDL is a results-driven, nonprofit organization. Our singular focus is to improve the life chances of all children, especially those at high risk, by increasing school success.

We provide professional learning that is specific and relevant to the needs of your students and your teachers.

We tackle real-time issues such as critical thinking and metacognition, remediating struggling readers, and building and sustaining collective capacity of students and teachers.

Our professional learning is designed, facilitated, evaluated, and adjusted to meet your needs. In collaboration with school and district leaders, we examine student and teacher data and build professional learning in response to student and teacher performance. We examine progress frequently and adjust accordingly.

Our specialists excel in the areas of reading, writing, leadership, critical thinking, early childhood development, how students learn, intervention and remediation, and learner-specific instruction. We have experts at all levels from early childhood through high school.

Give us a call - we are ready to travel to you.

About the Presenter

Anita Archer

Anita Archer, Ph.D., recipient of ten Outstanding Educator awards, serves as an educational consultant to state departments, county agencies, and school districts on explicit instruction and literacy instruction. She has taught elementary and middle school students and has served on the faculties of San Diego State University, the University of Washington, and the University of Oregon. She is nationally known for her presentations and publications on instructional procedures and literacy instruction and has co-authored numerous curriculum materials with Mary Gleason including REWARDS PLUS, REWARDS Writing and Skills for School Success. Most recently, Anita wrote a textbook on explicit instruction with Charles Hughes entitled Explicit Instruction: Effective and Efficient Teaching (Guilford, 2011).
MAKING IT STICK:

Research – Validated Practice Procedures

ANITA L. ARCHER, PHD
AUTHOR, CONSULTANT, TEACHER

For additional information on practice see Chapter 8 in:

www.explicitinstruction.org

Practice

It is virtually impossible to become proficient at a mental task without extended practice.
Willingham, 2009

Use it or lose it. Anonymous

How can we optimize practice?

1. Deliberate practice
2. Retrieval practice
3. Spaced practice
4. Varied practice
5. Mixed practice

Deliberate Practice

Deliberate practice is goal-oriented practice consciously devoted to improvement of a skill.

Deliberate Practice? Why?

Why is A an example of deliberate practice and B is not?

A. As you write your paragraph, stop and reread your paragraph to be sure it makes sense. Add transition words or phrases to make your paragraph flow.

B. Using your paragraph plan, write a paragraph.
Retrieval Practice

The effect of retrieval practice is the finding that long-term memory is increased when some of the learning period is devoted to retrieving the to-be-remembered information.

The effect is also sometimes referred to as testing effect or test-enhanced learning.

Two Little Lessons

Lesson 1 – Traditional Review
Lesson 2 – Retrieval Practice

MATH REVIEW

Traditional Review

Review - Integer

Integer
- whole number
- no fractional or decimal part
- can be positive and negative

Examples
+3 -3 -16 198

Review – Rational Numbers

Informal Definition: A rational number is a number that can be written as a simple fraction.

Formal Definition: A rational number is a number that can be in the form \( \frac{p}{q} \) where \( p \) and \( q \) are integers and \( q \) is not equal to zero.

Examples
\( \frac{1}{2} \) \( 1.5 = \frac{3}{2} \) \( -0.1 = -\frac{1}{10} \)

Review – Absolute Value

- An absolute value is the distance a number is from zero.
- Absolute values are positive.
MATH REVIEW

Retrieval Practice

Review – Integers

Write down the integers.

-5 1.43 1¾ 97 .09
3.14 43

Integer
- whole number
- not a fractional or digital part
- can be positive and negative.

Review – Integers

-10 4.43 9¾ 100 .6 3.14
-43 ½ .09 5,643.1 3,043

Rational Number

Show and explain why 2 is a rational number.
Review – Rational Numbers

Informal Definition: A rational number is a number that can be written as a simple fraction.

Formal Definition: A rational number is a number that can be in the form \( \frac{p}{q} \) where \( p \) and \( q \) are integers and \( q \) is not equal to zero.

\[ 2 = \frac{2}{1} \]

Rational Number

Show and explain why 0.75 is a rational number.

\[ 0.75 = \frac{75}{100} = \frac{3}{4} \]

Rational Number

Show and explain why 0.6 is a rational number.

\[ 0.6 = \frac{6}{10} = \frac{3}{5} \]
Write the absolute number for these numbers.

\[
\begin{array}{cccc}
12 & -7 & 0 & 215 \\
12 & 7 & 0 & 215
\end{array}
\]

-66 & -5 & 66 & 5

• An absolute value is the distance a number is from zero.
• Absolute numbers are positive.

Retrieval Practice – Why

Retrieval Practice makes learning STICK far better than re-exposure to the original material.

Retrieval Practice – Why

Retrieval Practice strengthens memory and interrupts forgetting.

Retrieval Practice makes that knowledge easier to retrieve in the future.

Neural pathways that make up a body of learning get stronger.

Effortful Retrieval Practice

Learning is deeper and more durable when it’s EFFORTFUL. Learning that’s easy is like writing in sand, here today and gone tomorrow. Brown, Roediger, and McDaniel (2014)

Retrieval Practice – Teacher - Guided

Example Procedures:
1. Practice without scaffolding
2. Rapid retrieval practice
3. Retrieval Practice Games
4. Quick write
5. Quick draw
6. Flash cards
7. Multiple-choice items using hand signals, Clickers, or Plickers
8. Written answers
Retrieval Practice

Example

Rapid Retrieval Practice

Irregular Verbs

- The suffix ed is NOT used to form the past tense of irregular verbs.

Today I speak. Yesterday I spoke.
Today I write. Yesterday I wrote.
Today I go. Yesterday I went.
Today I drink. Yesterday I drank.
Today I swim. Yesterday I swam.
Today I see. Yesterday I saw.
Today I sing. Yesterday I sang.
Today I fall. Yesterday I fell.
Today I hide. Yesterday I hid.

Retrieval Practice - Teacher-guided

Quick Write

Example

List some benefits of retrieval practice.

Retrieval Practice - Teacher-guided

Flash Cards

Set #1

New Content and
Difficult from the past

Set #2

Mastered Content

Retrieval Practice - Teacher-guided

Hand Signals, Clickers, or Plickers

Select the best answer.
1. Retrieval practice that is effortful promotes more learning.
2. Retrieval practice should occur after modeling and guided practice.
4. All of the above.
Summary - Retrieval Practice

Retrieval Practice Benefits
- learning
- durable retention

Effortful Retrieval Practice
- stronger learning
- stronger retention

Delayed Effortful Retrieval
- more learning
- more retention

Repeated Retrieval
- more learning
- more ease of retrieval

Corrective Feedback
- more learning

Spaced Practice

Spaced practice (also known as distributed practice) is a learning strategy, where practice is broken up into a number of short sessions - over a longer period of time.
Mass vs Spaced Practice

Mass Practice vs Spaced Practice –
Effect size $d = 0.71$  [Hattie, 2009]

Gains achieved in massed practice are transitory and melt away quickly.  [Brown, Roediger, McDaniel, 2014]

Spaced VS Mass Practice – Why?

Same time
Same effort
but Remember More

Spaced VS Mass Practice – Why?

“Distributed learning, in certain situations, can double the amount you remember later on.”

Carey, 2014

Spaced Practice

- Initial Practice
- Distributed Practice
- Cumulative Review

Spaced Practice

Initial Practice
- Occurs under watchful eye of the teacher
- Provide numerous practice opportunities within the teacher-directed lesson to build accuracy. Provide immediate feedback after each item.

Spaced Practice

Distributed Practice
- Studying or practicing a skill in short sessions overtime.
- Distributing practice overtime (versus massing practice in one session) aids retention in a variety of academic areas.
Spaced Practice

Cumulative Review

- Provide intentional review of previously taught skills/strategies/concepts/vocabulary/knowledge.
- Goal is to increase long-term retention.

Spaced Practice

What interval?

- Enough time that a little forgetting has set in leading to more effort.
- Not so much time that retrieval requires relearning of the material.

Example – Spaced Practice

Vocabulary – Core Reading Program

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro for Passage A</td>
<td>Quick retrieval practice</td>
<td>Quick review and elaboration of difficult words</td>
<td>Game - Mixed practice of difficult words A and B</td>
<td>Game - Mixed practice of difficult words A, B, and C</td>
</tr>
<tr>
<td>Intro for Passage B</td>
<td>Quick retrieval practice</td>
<td>Quick review and elaboration of difficult words</td>
<td>Game - Mixed practice of difficult words A and B</td>
<td>Game - Mixed practice of difficult words A, B, and C</td>
</tr>
<tr>
<td>Intro for Passage C</td>
<td>Quick retrieval practice</td>
<td>Quick review and elaboration of difficult words</td>
<td>Game - Mixed practice of difficult words A and B</td>
<td>Game - Mixed practice of difficult words A, B, and C</td>
</tr>
</tbody>
</table>

Varied Practice

Varied practice refers to use of a variety of practice tasks so that the performer is confronting novel examples of the to-be-learned information.

Varied Practice

Vary the practice conditions to increase ability to apply the skill or strategy to a new setting.

Non-example – 1st grade decoding

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>man</td>
<td>ran</td>
<td>nan</td>
<td>tan</td>
</tr>
<tr>
<td>pan</td>
<td>ban</td>
<td>Jan</td>
<td>tan</td>
</tr>
<tr>
<td>fan</td>
<td>tan</td>
<td>man</td>
<td>Jan</td>
</tr>
<tr>
<td>tan</td>
<td>Dan</td>
<td>Nan</td>
<td>fan</td>
</tr>
<tr>
<td>ran</td>
<td>lan</td>
<td>lan</td>
<td>ran</td>
</tr>
</tbody>
</table>
**Varied Practice**

Vary the practice conditions to increase ability to apply the skill or strategy to a new setting.

**Example – 1st grade decoding (“encoding”)**

<table>
<thead>
<tr>
<th>Day #1</th>
<th>Day #2</th>
<th>Day #3</th>
<th>Day #4</th>
</tr>
</thead>
<tbody>
<tr>
<td>at</td>
<td>am</td>
<td>an</td>
<td>had*</td>
</tr>
<tr>
<td>are</td>
<td>sad*</td>
<td>Pat</td>
<td>ran</td>
</tr>
<tr>
<td>Sam</td>
<td>map</td>
<td>sad*</td>
<td>Pam*</td>
</tr>
<tr>
<td>man</td>
<td>mad</td>
<td>tap</td>
<td>fans</td>
</tr>
<tr>
<td>fan*</td>
<td>Sam*</td>
<td>had</td>
<td>map</td>
</tr>
<tr>
<td>main</td>
<td>main</td>
<td>Nan*</td>
<td>taps*</td>
</tr>
<tr>
<td>rat</td>
<td>mat*</td>
<td>tap*</td>
<td>ham</td>
</tr>
</tbody>
</table>

The rat ran. The man had a nap. Pat and Nan sat. Pam and Pat had fans.

Sam had a fan. Sam is a sad man. on mats. fans.

**Mixed Practice - Interleaving**

**Recommended Reading**

- Make it Stick: The Science of Successful Learning
- Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement
- How We Learn: The Surprising Truth About Where, When, and Why It Happens
- Visible Learning and the Science of How We Learn

**Recommended Reading**

- Varied Practice
  - Non-Example
    - bake + ing = baking
    - rake + ing = raking
    - make + ing = making
    - brake + ing = braking
  - Example
    - ride + ing = riding
    - fame + ous = famous
    - excite + ing = exciting
    - excele + ment = excitement
    - race + ist = racist
    - shame + ed = shamed
    - shame + ful = shapeful