

## MAKE IT STICK! THE SCIENCE OF PRACTICE

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### Webinar for Explicit Instruction TOT Participants

#### Part 2

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For additional information on practice see Chapter 8 in:

Archer, A., & Hughes, C. (2011). *Explicit Instruction: Effective and Efficient Teaching*. NY: Guilford Publications.

[www.explicitinstruction.org](http://www.explicitinstruction.org)

## Learning Intentions

Participants will carefully plan practice activities, considering:

1. The **purpose** of the practice.
2. The **research** on practice (deliberate practice, retrieval practice, spaced practice, varied practice).
3. The **type of practice** matched to the skill/strategy/concept.
4. The **modality** demanded by the **outcome**.

Participants will provide feedback to students on their performance designed to:

1. **Fill the gap** between current performance and desired performance.
2. Foster a **growth mindset** (rather than a fixed mindset).

## Purposes of Practice

The purposes of practice are:

1. To gain **minimum competency** on a skill
2. To **improve** and gain **proficiency** on a skill
3. To gain **automaticity** on foundation skills needed for higher order skills
4. To **protect against forgetting**
5. To improve **transfer** of skills

## Automaticity – Reading

- Both empirical and clinical research support the relationship between fluent oral reading and overall reading ability including comprehension.  
(Cunningham & Stanovich, 1998; Fuchs, Fuchs, & Maxwell, 1988; Gough, Hoover, & Peterson, 1996; Herman, 1985; Jenkins, Fuchs, Espin, van den Broek, & Deno, 2000)
- When students read fluently, decoding requires less attention. Attention can be given to comprehension.  
(Samuels, Schermer, & Reinking, 1992)

## Automaticity – Math Facts

Students who recall their basic facts accurately and quickly have greater cognitive resources available to learn more complex tasks or concepts.

(McCallum, et al., 2006; Poncy, et al., 2006).

## Automaticity – Keyboarding

Connelly, Gee, and Walsh (2007)

**Subjects:** 300 UK students in year 5 and 6.

**Procedure:** Measured students' handwriting and keyboarding fluency and students' compositional quality by hand and keyboarding.

- **Results:** There was a high correlation between handwriting and keyboarding speed and handwriting speed was consistently faster than keyboarding speed. Results showed that children's compositional quality was superior in the handwritten scripts as opposed to the keyboarded scripts. Keyboarded scripts were up to 2 years behind handwritten scripts in development across all ages.

## How can we optimize practice?

Review

1. Deliberate practice
2. Retrieval practice
3. Spaced practice

New

1. Varied practice
2. Mixed practice

## 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.

## Deliberate Practice?

Why is 1 an example of *deliberate practice* and 2 is not?

- 1. You are going to tell your partner the history of suffrage in the United States. To prepare, make a list of the major historical advances in suffrage.  
  
Ones, tell your partner a history of suffrage and the significance of each major event.  
Twos, add any missing events.
- 2. Tell your partner the history of suffrage.

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## Deliberate Practice? Why?

Why is 1 an example of *deliberate practice* and 2 is not?

- 1. 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.
- 2. Using your paragraph plan, write a paragraph.

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## Deliberate Practice

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

## Retrieval Practice? Why?

1. Every Friday, Mr. Davidson reviews vocabulary and the big ideas covered in Social Studies in the past two weeks. First, the students reread their vocabulary logs and explain entries to their partners. Next, students write summaries using their notes.
2. Every Friday, Mr. Davidson gives an open book quiz. The first items involve use of the vocabulary within the context of social studies. The remaining items focus on the big ideas and their significance in history. The quiz is graded in class augmented with class discussion.
3. Every Friday, Mr. Davidson gives a closed book quiz covering vocabulary taught in the past two weeks plus critical vocabulary from past units. The remaining items focus on the big ideas and their significance. The quiz is graded in class augmented with class discussion.

## 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

## Best Spaced Practice? Why

1. Ms. Inaba Introduces vocabulary for passage reading each Monday. At the end of the session, she and her students reread the words and their definitions.
2. Ms. Inaba introduces vocabulary for passage reading each Monday. The next day, she reviews the vocabulary for 5 to 10 minutes in which the students listen to a definition and determine the matching word listed on the word wall. On Thursday, Ms. Inaba repeats this activity with other words. Each Friday, students play a game focusing on difficult words from the current week and past weeks.
3. Ms. Inaba introduces vocabulary for passage reading each Monday. On Tuesday in the following week, she reviews the vocabulary for 5 to 10 minutes in which the students listen to a definition and determine the corresponding word. Each Friday, students play a game focusing on difficult words from the last two weeks and difficult words from past weeks.

## 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.

## Spaced VS Mass Practice – Why?

Same time  
Same effort  
but Remember More

## 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** – 1<sup>st</sup> grade decoding

Day #1	Day #2	Day #3	Day #4
man	ran	can	van
pan	ban	Jan	ban
fan	can	man	Jan
tan	Dan	Nan	fan
ran	fan	tan	ran

## Varied Practice

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

**Example** – 1<sup>st</sup> grade decoding (\*encoding)

Day #1	Day #2	Day #3	Day # 4
at	am	an	had*
am *	sad*	Pat	ram
Sam	nap	lad*	Pam*
ad	mad	sap	fans
fan*	Sam*	had	map
man*	man	Nan*	taps*
rat	mat*	tap*	ham
The rat ran.	The man had a nap.	Pat and Nan sat	Pam and Pat had
Sam had a fan.	Sam is a sad man.	on mats.	fans.

## 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  
 excite + ment = excitement  
 race + ist = racist  
 shame + ed = shamed  
 shame + ful = shameful

## Mixed Practice (Interleaving Practice)

- Block practicing is when you focus on learning one skill at a time. You practice a skill repetitively for a period of time and then you move onto another skill and repeat the process. Interleaving practice on the other hand involves working on multiple skills in parallel.
- If you want to learn skills A, B and C then a block practice session would look something like this AAABBBCCC and an interleaved practice session would look like this ABCABCABC (in series) or ACBABCBCA (randomized). The only constraint is that you can't work on the same type of problem back to back.

## Mixed Practice - Interleaving

Subjects: Elite baseball players on a college team

Content: Twice a week batting practice

Condition A: **Traditional practice**

45 pitches in 3 sets

15 pitches of one type (fast, curve, change up)

Condition B: **Mixed practice**

3 types of pitches randomly distributed across 45 pitches

Results: Randomly interspersed pitches displayed markedly better hitting

## Mixed Practice - Interleaving

When you understand a problem type, mix the problem type with other problem types.

cry + ed = cried	play + er = player	slice + ing = slicing
copy + ing = copying	stamp + ed = stamped	fame + ous = famous
refuse + al = refusal	harm + less = harmless	race + ist = racist
funny + est = funniest	envy + ed = envied	fury + ous = furious

## Mixed Practice - Interleaving

Name \_\_\_\_\_ LESSON 58B  
Date \_\_\_\_\_ Math 2

Write a number sentence for the story. Write the answer with a label.

1. Seven children chose chocolate chip cookies, three children chose ice cream, and eight children chose peanut butter cookies. How many children chose cookies?  
Number sentence \_\_\_\_\_  
Answer \_\_\_\_\_

2. Circle the numbers that are between 48 and 55.  
Put an X on the number that is not between 46 and 53.

54 47 50 49 43

3. Someone drew a line of symmetry in each shape. Circle the shape with the incorrect line of symmetry.



4. Find each answer.

$95 - 10 =$ _____	$52 + 10 =$ _____	$69 - 10 =$ _____	$21 + 10 =$ _____	$84 - 10 =$ _____
$38 + 10 =$ _____				

5. Color one fourth green.  
Color seven eighths yellow.  
Color one half red.



6. What time do you usually go to bed at night?  
Show the time on the clock.



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## Practice Formats

1. Paper - Pencil Tasks
2. Practice Activities embedded in Group Instruction
3. Peer – Focused Activities
4. Computer – Assisted Instruction

## Design Practice Plans

1. Are critical skills/strategies/concepts practiced to a high level of mastery (accuracy)?
2. Are critical foundation skills/concepts practiced to a high level of automaticity (fluency)?
3. The practice:
  - a. is deliberate
  - b. requires retrieval when a minimal level of competency is demonstrated
  - c. is spaced overtime
  - d. is varied

## What about Learning Styles?

### Learning Style Theory

#### • Hypothesis

- Students have a cognitive style, a preferred way of receiving knowledge.
  - Visual, Auditory, Kinesthetic
- Students will learn better when instruction matches their cognitive style.

## What about Learning Styles?

### Findings

- No evidence to support this premise. (Pashler, McDaniel, Rohrer, Bjork, 2008)
- More important that mode of instruction matches nature of subject being taught.
  - Visual instruction for geometry
  - Verbal instruction for poetry

## Example Plan #1

Kindergarten – Decoding

### Current Program

- Letter-sound associations are introduced using key word and poem.
- Word lists containing target elements are provided (eg., ran, fat, sap).
- Short passages with target words are provided.

### Plan

## Example Plan #1

Kindergarten – Decoding

### Current Program

- Letter-sound associations are introduced using key word and poem.
- Word lists containing target elements are provided (eg., ran, fat, sap).
- Short passages with target words are provided.

### Plan

- Provide retrieval practice on letter-sound associates during small group/whole group instruction using electronic flashcards.
- Focus on new and difficult letter-sounds. Recycle letter-sounds that are not retained.
- Add discrimination words to word lists (varied practice)
- Reread lists to increase automaticity.
- Reread passages to partner and parents.

## Example Plan #2

Middle School Language Arts

### Current Program

#### Literary Terms

Literary terms are introduced with each unit but not consistently reviewed.

### Plan

## Example Plan #2

### Middle School Language Arts

#### Current Program

##### Literary Terms

Literary terms are introduced with each unit but not consistently reviewed.

#### Plan

- a. Create a reference sheet with literary terms. Post terms on Word Wall.
- b. During discussions, students will refer to the reference sheet or word wall, using academic literary terms in their comments.
- c. On weekly quizzes, items on the literary terms will be included.
- d. On open-ended questions, students will earn bonus points for appropriate use of literary terms.

## Example Plan #3

### Middle School Language Arts

#### Practice Needed

##### 3. Writing

Seven writing types are taught. Students write one product for each type.

#### Plan

- a. Teach three types: argumentative, informative, narrative.

## Example Plan #3

### Middle School Language Arts

#### Current Program

##### 3. Writing

Seven writing types are taught. Students write one product for each type.

#### Plan

- a. Teach three types: argumentative, informative, narrative.
- b. Provide careful instruction on argumentative.
- c. Have students write minimum of four in LA class.
- d. Introduce planning tools and rubric to staff.
- e. Have students continue practice of writing type in other classes.
- f. Repeat cycle for informative.

## Example Plan #4

### 7<sup>th</sup> grade math

#### Current Program:

- 15 units
- Lessons include 4 – 6 items for guided practice after modeling.
- 10 – 15 practice items provided on new skill/strategy/concept.
- 5 – 10 problem-solving items provided on the target skill/strategy/concept.
- At the end of each unit, practice exercises provide review of all skills taught in the unit.

#### Plan

## Example Plan #4 7<sup>th</sup> grade math

### Current Program:

- 15 units
- Lessons include 4 – 6 items for guided practice after modeling.
- 10 – 15 practice items provided on new skill/strategy/concept.
- 5 – 10 problem-solving items provided on the target skill/strategy/ concept.
- At the end of each unit, practice exercises provide review of all skills taught in the unit.

- Plan**
- **Do-Now Activity.** Beginning of class warm-up activity will include two items from last 3 lessons plus 2 items from previous units (Mixed practice)
  - **Vocabulary.** Students create vocabulary flash cards (Front – Word; Back – Definition broken into critical attributes and examples). Twice a week, students will study with their partners.
  - **Modeling (I do it)** using items provided.
  - **Guided practice (We do it.)** Teacher guides students in completing easy then more difficult practice items.
  - **Unprompted practice (You do it.)** Students complete selected practice items ranging in difficulty.
  - **Independent practice** – When students show competency, independent practice items assigned.
  - **Exit activity** – Using electronic flash cards, students tell partners meaning of words.

## Example Plan # 5 8<sup>th</sup> Grade Social Studies

### Current Program

- **American History** – Colonization to Industrial Revolution
- **Frontloading:** Background Knowledge and Vocabulary Instruction
- **Passage Reading:** Paragraph Shrinking with Partners
- **Post Reading:** Students answer questions, participate in a discussion, and respond in writing (summary, compare-contrast)
- **Quiz:** At the end of the chapter

### Plan

## Example Plan # 5 8<sup>th</sup> Grade Social Studies

### Current Program

- **American History** – Colonization to Industrial Revolution
- **Frontloading:** Background Knowledge and Vocabulary Instruction
- **Passage Reading:** *Paragraph Shrinking* with Partners
- **Post Reading:** Students answer questions, participate in a discussion, and respond in writing (summary, compare-contrast)
- **Quiz:** At the end of the chapter

### Plan

- **Warm-up:** Students are given a topic and students list what they remember. Teacher provides feedback.
- Major events summarized: **Conflict – Actions – Outcomes**
- **Timeline Review:** Twice a week, retrieval practice is provided using major events in timeline. Students tell the “story” of the event using **Conflict – Actions – Outcomes** structure.

## Providing Feedback

“Instruction is more effective than feedback. Feedback can only build on something; it is of little value when there is no initial learning or surface information.” (Hattie & Timperley, 2007)

## Providing Feedback

**Feedback is designed to close the gap between current performance and desired goal**

- a. Feedback should focus on the task performance in relationship to goal
- b. Feedback should be specific and clear
- c. Feedback should be provided in a timely manner

## Providing feedback

- Self-corrections against a key
- Self-corrections during instructional group
- Self-evaluation against a rubric
- Structured peer feedback using rubric

## Providing feedback

- Teacher feedback on responses during instruction
- Teacher feedback as he/she circulates and monitors
- Teacher feedback to group on assignment
- Teacher feedback to individuals
- Teacher corrections/written feedback

## Provide feedback that promotes a growth mindset (Dweck, 2002)

Fixed Mindset	Growth Mindset
Believe that intellectual ability is fixed from birth, wired in their genes.	Believe that effort and learning change intellectual abilities. Thus, abilities are under their control.
Avoid challenges at which they might not succeed.	More likely to take risks and tackle difficulties.
Failure would indicate less native ability.	

## **Provide feedback that promotes a growth mindset** (Dweck, 2002)

Focus feedback on:

- Performance in relationship to goal
- Changes in achievement
- Attributes under student control (effort, tenacity, concentration)

DON'T focus on inherent qualities

**“Practice isn’t the thing you do once you’re good. It’s the thing you do that makes you good.” - Malcolm Gladwell**