

Research Based Interventions/Strategies

The following interventions/strategies are broken into Reading Comprehension, Reading Fluency, Math Computation, and Math Reasoning. These are examples, not a list of the only research based interventions. The following websites are good resources for finding additional research based interventions.

www.interventioncentral.org,

<http://ies.ed.gov/ncee/wwc/>

http://www.jimwrightonline.com/php/rti/rti_wire.php

Reading Comprehension:

1. **"Click or Clunk?": A Student Comprehension Self-Check**: **Step 1:** Tell students that they will be learning ways to read more carefully. Hand out student copies of My Reading Check Sheet (see attachment at the bottom of this page).

Review all of the reading strategies on the student handout.

Instruct students that, during any reading assignment, when they come to:

- The end of each sentence, they should ask the question, "Did I understand this sentence?" If students understand the sentence, they say "Click!" and continue reading. If they do not understand, they say "Clunk!" and refer to the strategy sheet My Reading Check Sheet to correct the problem.
- The end of each paragraph, they should ask the question, "What did the paragraph say?" If they do not know the main idea(s) of the paragraph, students refer to the strategy sheet My Reading Check Sheet to correct the problem.
- The end of each page, they should ask the question, "What do I remember?" If they do not remember sufficient information, students refer to the strategy sheet My Reading Check Sheet to correct the problem.

Read through a sample passage with the class. At the end of each sentence, paragraph, and page, "think aloud" as you model use of the comprehension checks. (As you read each sentence, be sure to call out "Click!" when you and the class understand a sentence and "Clunk!" when you do not.)

Step 2: When students have learned to use the "Click or Clunk?" strategy, have them use it in independent reading assignments.

2. **Advanced Story Map**: **•Step 1:** Introduce the concept of a Story Grammar to students and preview main elements. (Refer to the Advanced Story Map Worksheet as a guide.) Tell students that a Story Grammar can help them to better understand a story's characters and events.

•Step 2: Set aside at least four successive instructional days to introduce the major components of the Story Grammar: (A) Identifying important characters and their personalities and motivation, (B) Identifying main problem and significant plot developments, (C) Noting characters' attempts to solve problems, and (D) Identifying a narrative's overarching theme.

Interactive Instruction: Make the instruction of each story component highly interactive, with clear teacher demonstration and use of examples. 'Think aloud' as you read through a story with the class to illustrate to students how you arrive at your conclusions. Elicit student discussion about the story. As you fill out sections of the Advanced Story Map Worksheet on the overhead, have students write responses on their own copies of the worksheet.

•**Step 3:** Error Correction: When students commit errors, direct them to the appropriate section of the narrative to reread it for the correct answer. Use guiding questions and modeling as necessary to help students to come up with an appropriate response.

•**Step 4:** After students have been introduced to the key Story Grammar elements, the group is now ready to use the Grammar to analyze a sample narrative passage. Have students read independently through a story. Pause at pre-determined points to ask the group key questions (e.g., "Who is the main character? What is she like?"). After discussion, encourage students to write their answers on the Advanced Story Map Worksheet while you fill out the same worksheet as an overhead. Give specific praise to students for appropriately identifying Story Grammar elements.

•**Step 5:** When students are able to use the Story Grammar independently, have them read through selected stories and complete the Advanced Story Map Worksheet on their own. Check students' responses and conference individually with those students requiring additional guidance and support.

3. **Keywords: A Memorization Strategy:** Step 1: Tell students that a good way to remember lots of facts is to use keywords. With the keyword approach, students:

- Highlight important facts or ideas in a passage
- Write a "gist" sentence that summarizes the highlighted ideas or facts
- Select a 'keyword' that will help them to recall a central idea about the article or passage.
- Create a mental picture to remember the keyword, and then
- Add details to the mental picture or create a story around the keyword to memorize additional facts or ideas.

If you have younger students (e.g., 5th grade or below), read through several sample passages with the group.

Then display a drawing or collage that represents your own representation of the passage's main ideas as mental imagery. Using a "think-aloud" approach, explain the mental imagery of the picture and show how it encapsulates the main facts of the original passage. Show students how they can more easily recall facts using this approach.

If you have older students (e.g., 6th grade or above), read through several sample passages with the group. Write a description of the mental imagery that you used to memorize the keyword and related facts. Using a "think-aloud" approach, explain the mental imagery of your keyword and related story and show how the imagery encapsulates the main facts of the original passage. Show students how they can more easily recall facts using this approach.

Step 2: Pair students off and give them a sample passage. Assign each pair of students to:

- Identify the main idea of the passage
- Write a "gist" sentence to summarize the passage's main idea and related important facts
- Select a keyword based on the main idea
- Write out a description (or draw a picture) of the mental imagery that they will use to recall the main idea and important facts of the passage.

Step 3: When students are able to use the keyword strategy independently, have them use the technique when reading through expository passages. Monitor students' use of the method and their accuracy in recalling key facts. Conference individually with those students needing additional guidance and support.

4. **Reading Recovery Program**

5. **Compass Learning**

6. **Mental Imagery: Improving Text Recall:** Step 1: Tell students that they can remember more of what they read by:

- making pictures in their mind of what they are reading
- carefully studying pictures or illustrations that appear in their reading or text books

Step 2: Using a "think-aloud" approach, read through a short sample narrative or expository passage. Pause at several points to tell the class what "mental pictures" come to your mind as you read; ask students to describe their own mental imagery as they react to the same passage. As you come across pictures or illustrations in the passage, study them and reflect aloud on what clues they give you about the passage's meaning.

Step 3: Read aloud from additional passages. Stop at key points in the passage and call on students to relate their mental imagery evoked by the passage or to give their interpretation of the significance of illustrations or pictures.

Step 4: When students are able to use mental imagery independently, use a prompt at the start of reading assignments to cue them to use the strategy. You might say, for example, "Now we are going to read about what life is like in a country village in Zimbabwe. Remember to make pictures in your head about what you are reading and study the pictures carefully."

Reading Fluency

1. **Choral Reading:** Choral reading is an interpretive reading of text, often poetry or songs, by a group of voices. Students may read individual lines or stanzas alone, in pairs, or in unison. Choral reading, sometimes called "unison reading," requires repeated readings of a particular passage and it gives practice in oral reading. It is especially well suited to rhymes, poetry, and lyrics. As part of the activity, the teacher also reads to help set the pace, as well as model proper pronunciation. The poems or passages can be "performed" for other students. Ultimately, though, enjoyment and learning should come out of the process of figuring out HOW to perform the poem rather than the performance itself.

2. **Error Correction & Word Drill Techniques:**

Word Supply:

Before the student begins to read, tell the student, "If you come to a word that you do not know, I will help you with it. I will tell you the correct word while you listen and point to the word in the book. After that, I want you to repeat the word and continue reading. Try your best not to make mistakes." When the student commits a reading error (e.g., substitution, omission, 5-second hesitation), immediately pronounce the correct word for the student, have the student repeat the word correctly, and then direct the student to continue reading. NOTE: To avoid too many reading interruptions, do not correct minor student errors (e.g., misreading or omitting the or a, dropping suffixes such as -s, -ed, or -ing)

Word supply is the simplest error-correction to use, so it can be ideal for student tutors or parents to use. On the other hand, the approach is less powerful than others described here for building student reading vocabulary (Singh, 1990).

Sentence Repeat:

At the start of the reading session, say to the student, "If you come to a word that you do not know, I will help you with it. I will tell you the correct word while you listen and point to the word in the book. After that, I want you to repeat the word and then read the rest of the sentence. Then I want you to read the sentence again. Try your best not to make mistakes."

When the student commits a reading error (e.g., substitution, omission, 5-second hesitation), immediately pronounce the correct word for the student and have the student repeat the word correctly. Then direct the student to reread the entire sentence in which the error occurred. The student then continues reading the passage. (If the student repeats the original reading error when rereading the sentence, you should again pronounce the word correctly and have the student repeat the word. Then continue on.) NOTE: To avoid too many

reading interruptions, do not correct minor student errors (e.g., misreading or omitting the or a, dropping suffixes such as -s, -ed, or -ing) (Singh, 1990).

'Word Attack' Hierarchy:

In this approach, the instructor prompts the student to apply a hierarchy of word-attack skills whenever the student misreads a word. The instructor gives these cues in descending order. If the student correctly identifies the word after any cue, the instructor stops delivering cues at that point and directs the student to continue reading.

NOTE: To avoid too many reading interruptions, do not correct minor student errors (e.g., misreading or omitting the or a, dropping suffixes such as -s, -ed, or -ing).

Here are the 'Word Attack' Hierarchy instructor cues:

- 1. "Try another way." This cue is given directly after a reading error and alerts the student to the fact that she or she has misread the word.
- 2. "Finish the sentence and guess the word." The student is encouraged to make use of the sentence context to discover the correct word pronunciation.
- 3. "Break the word into parts and pronounce each one." The student is directed to sound out the segments of a word independently.
- 4. Using an index card, the tutor covers over parts of the word and each the student to sound out only the part of the word that is visible. This approach teaches the student a method for reducing the amount of visual information in each word.
- 5. "What sound does ' ___ ' make?" As the tutor covers selected parts of the word with an index card, the student is directed to use phonics information to sound out the word.
- 6. "The word is ___." If the student cannot decode the word despite instructor support, the instructor supplies the word. The student is directed to repeat the word and to continue reading.
(Haring, et al., 1978).

Error Word Drill:

The Error Word Drill is an effective way to build reading vocabulary. The procedure consists of 4 steps:

When the student misreads a word during a reading session, write down the error word and date in a separate "Error Word Log".

- 1. At the end of the reading session, write out all error words from the reading session onto index cards. (If the student has misread more than 20 different words during the session, use just the first 20 words from your error-word list. If the student has misread fewer than 20 words, consult your "Error Word Log" and select enough additional error words from past sessions to build the review list to 20 words.)
- 2. Review the index cards with the student. Whenever the student pronounces a word correctly, remove that card from the deck and set it aside. (A word is considered correct if it is read correctly within 5 seconds. Self-corrected words are counted as correct if they are made within the 5-second period. Words read correctly after the 5-second period expires are counted as incorrect.)
- 3. When the student misses a word, pronounce the word for the student and have the student repeat the word. Then say, "What word?" and direct the student to repeat the word once more. Place the card with the missed word at the bottom of the deck.
- 4. Error words in deck are presented until all have been read correctly. All word cards are then gathered together, reshuffled, and presented again to the student. The drill continues until either time runs out or the student has progressed through the deck without an error on two consecutive cards.

3. Paired Reading:

Step 1: Sit with the student in a quiet location without too many distractions. Position the book selected for the reading session so that both you and the student can easily follow the text.

Step 2: Say to the student, "Now we are going to read aloud together for a little while. Whenever you want to read alone, just tap the back of my hand like this [demonstrate] and I will stop reading. If you come to a word you don't know, I will tell you the word and begin reading with you again."

Step 3: Begin reading aloud with the student. If the student misreads a word, point to the word and pronounce it. Then have the student repeat the word. When the student reads the word correctly, resume reading through the passage.

Step 4: When the child delivers the appropriate signal (a hand tap), stop reading aloud and instead follow along silently as the student continues with oral reading. Be sure occasionally to praise the student in specific terms for good reading (e.g., "That was a hard word. You did a nice job sounding it out!").

Step 5: If, while reading alone, the child either commits a reading error or hesitates for longer than 5 seconds, point to the error-word and pronounce it. Then tell the student to say the word. When the student pronounces the error-word correctly, begin reading aloud again in unison with the student.

Step 6: Continue reading aloud with the student until he or she again signals to read alone.

4. **Assisted Reading Practice**: •Step 1: Sit with the student in a quiet location without too many distractions. Position the book selected for the reading session so that both you and the student can easily follow the text. (Or get two copies of the book so that you each have your own copy.)

•Step 2: Instruct the student to begin reading out loud. Encourage him or her to "do your best reading."

•Step 3: Follow along silently in the text as the student reads.

•Step 4: If the student mispronounces a word or hesitates for longer than 5 seconds, tell the student the word. Have the student repeat the word correctly. Direct the student to continue reading aloud through the passage.

•Step 5: Occasionally, praise the student in specific terms for good reading (e.g., "You are doing a really great job of sounding out the words that you don't know. Good work!").

5. **Compass Learning**

6. **Reading Recovery**

Math Fluency

1. **Compass Learning**

2. **Do the Math**

3. **Math Computation: Promote Mastery of Math Facts Through Incremental Rehearsal:** In preparation for this intervention:

•1. The tutor first writes down on an index card in ink each math fact that a student is expected to master-but without the answer. NOTE: Educators can use the A-Plus Math Flashcard Creator, a free on-line application, to make and print flashcards in addition, subtraction, multiplication, and division. The web address for the flashcard creator is: www.aplusmath.com/Flashcards/Flashcard_Creator.html

•2. The tutor reviews the collection of math-fact cards with the student. Any of the math facts that the student can orally answer correctly within two seconds are considered to be known problems and are separated into one pile. Math facts that the student cannot yet answer correctly within two seconds are considered 'unknown' and collected in a second pile -- the 'unknown facts' deck.

•3. The tutor next randomly selects 9 cards from the pile of known math facts and sets this subset of cards aside as the 'known facts' deck. The rest of the pile of cards containing known math facts is put away ('discard deck'), not to be used further in this intervention.

During each day of the intervention:

The tutor follows an incremental-rehearsal sequence each day when working with the student:

•First, the tutor takes a single card from the 'unknown facts' deck. The tutor reads the math fact on the card aloud, provides the answer, and prompts the student to read off and answer the same unknown problem.

•Next the tutor takes one math fact from the 'known facts' deck and pairs it with the unknown problem. When shown the two problems in sequence, the student is asked during the presentation of each math fact to read off the problem and answer it. The student is judged to be successful on a problem if he or she orally provides the correct answer to that problem within 2 seconds. If the student commits an error on any card or hesitates for longer than two seconds, the tutor reads the math fact on the card aloud, gives the answer, then prompts the student to read off the same unknown problem and provide the answer. This review sequence continues until the student answers all cards within two seconds without errors.

•The tutor then repeats the sequence--taking yet another problem from the 'known facts' deck to add to the expanding collection of math facts being reviewed ('review deck'). Each time, the tutor prompts the student to read off and answer the whole series of math facts in the review deck, beginning with the unknown fact and then moving through the growing series of known facts that follow it.

•When the review deck has expanded to include one 'unknown' math fact followed by nine 'known' math facts (a ratio of 90 percent 'known' material to 10 percent 'unknown' material), the last 'known' math fact that was added to the student's review deck is discarded (put away with the 'discard deck'). The previously 'unknown' math fact that the student has just successfully practiced in multiple trials is now treated as a 'known' math fact and is included as the first item in the nine-card 'known facts' deck for future drills.

•The student is then presented with a new math fact to answer, taken from the 'unknown facts' deck. With each new 'unknown' math fact, the review sequence is again repeated as described above until the 'unknown' math fact is grouped incrementally with nine math facts from the 'known facts' deck-and on and on.

Daily review sessions are discontinued either when time runs out or when the student answers an 'unknown' math fact incorrectly three times.

4. Math Computation: Increase Accuracy and Productivity Rates Via Self-Monitoring and Performance Feedback: In preparation for this intervention:

•the teacher selects one or more computation problem types that the student needs to practice. Using that set of problem types as a guide, the teacher creates a number of standardized worksheets with similar items to be used across multiple instructional days. (A Math Worksheet Generator that will create these worksheets automatically can be accessed at <http://www.interventioncentral.org>).

•The teacher prepares a progress-monitoring chart. The vertical axis of the chart extends from 0 to 100 and is labeled 'Correct Digits' The horizontal axis of the chart is labeled 'Date'.

•The teacher creates a menu of rewards that the student can choose from on a given day if the student was able to exceed his or her previously posted computation fluency score.

At the start of the intervention, the teacher meets with the student. The teacher shows the student a sample math computation worksheet and answer key. The teacher tells the student that the student will have the opportunity to complete similar math worksheets as time drills and chart the results. The student is told that he or she will win

a reward on any day when the student's number of correctly computed digits on the worksheet exceeds that of the previous day.

During each day of the intervention:

- 1. The student is given one of the math computation worksheets previously created by the teacher, along with an answer key. The student first consults his or her progress-monitoring chart and notes the most recent charted computation fluency score previously posted. The student is encouraged to try to exceed that score.
- 2. When the intervention session starts, the student is given a pre-selected amount of time (e.g., 5 minutes) to complete as many problems on the computation worksheet as possible. The student sets a timer for the allocated time and works on the computation sheet until the timer rings.
- 3. The student then uses the answer key to check his or her work, giving credit for each correct digit in an answer. (A 'correct digits' is defined as a digit of the correct value that appears in the correct place-value location in an answer. In this scoring method, students can get partial credit even if some of the digits in an answer are correct and some are incorrect.)
- 4. The student plots his or her computational fluency score on the progress-monitoring chart and writes the current date at the bottom of the chart below the plotted data point. The student is allowed to select a choice from the reward menu if he or she exceeds the most recent, previously posted fluency score.

5. Math Computation: Increase Accuracy By Intermixing Easy and Challenging Computation

Problems 1.The teacher first identifies one or more 'challenging' problem-types that are matched to the student's current math-computation abilities (e.g., multiplying a 2-digit number by a 2-digit number with regrouping).

2.The teacher next identifies an 'easy' problem-type that the students can complete very quickly (e.g., adding or subtracting two 1-digit numbers).

3.The teacher then creates a series of student math computation worksheets with 'easy' computation problems interspersed at a fixed rate among the 'challenging' problems. (NOTE: Instructions are included below for creating interspersal worksheets using a free online application from www.interventioncentral.org.)

- If the student is expected to complete the worksheet independently as seat work or homework, 'challenging' and 'easy' problems should be interspersed at a 1:1 ratio (that is, every 'challenging' problem in the worksheet is followed by an 'easy' problem).

- If the student is to have the problems read aloud and then asked to solve the problems mentally and write down only the answer, the items should appear on the worksheet at a ratio of 3:1 (that is, every third 'challenging' problem is followed by an 'easy' one).

Directions for On-Line Creation of Worksheets With a Mix of Easy and Challenging Computation Problems ('Interspersal Worksheets')

By following the directions below, teachers can use a free on-line Math Worksheet Generator to create computation worksheets with easy problems interspersed among more challenging ones:

- The teacher goes to the following URL for the Math Worksheet Generator:

<http://www.interventioncentral.org/tools/math-worksheet-generator>

- Displayed on that Math Worksheet Generator web page is a series of math computation goals for addition, subtraction, multiplication, and division. Teachers can select up to five different problem types to appear on a student worksheet. Each problem type is selected by clicking on the checkbox next to it.

- The tutor then repeats the sequence--taking yet another problem from the 'known facts' deck to add to the expanding collection of math facts being reviewed ('review deck'). Each time, the tutor prompts the student to read off and answer the whole series of math facts in the review deck, beginning with the unknown fact and then moving through the growing series of known facts that follow it.

- It is simple to create a worksheet with a 1:1 ratio of challenging and easy problems (that is, with an easy problem following every challenging problem). First, the teacher clicks the checkbox next to an 'easy' problem type that the student can compute very quickly (e.g., adding or subtracting two 1-digit numbers). Next the teacher selects a 'challenging' problem type that is instructionally appropriate for the student (e.g., multiplying a 2-digit number by a 2-digit number with regrouping). Then the teacher clicks the 'Multiple Skill Computation Probe' button. The computer program will then automatically create a student computation worksheet and teacher answer key with alternating easy and challenging problems.

- It is also convenient to create a worksheet with a higher (e.g., 2:1, 3:1, or 4:1) ratio of challenging problems to easy problems. The teacher first clicks the checkbox next to an 'easy' problem type that the student can compute very quickly (e.g., adding or subtracting two 1-digit numbers). The teacher then selects up to four different challenging problem types that are instructionally appropriate to the student. Depending on the number of challenging problem types selected, when the teacher clicks the 'Multiple Skill Computation Probe' button, the computer program will create a student computation worksheet and teacher answer key that contain 2 (or 3 or 4) challenging problems for every easy problem.

Because the computer program generates new worksheets each time it is used, the teacher can enter the desired settings and -in one sitting-- create and print off enough worksheets and answer keys to support a six- or eight-week intervention.

6. **Accelerated Math**

Math Reasoning

1. Applied Math Problems: Using Question-Answer Relationships (QARs) to Interpret Math

Graphics: Teachers need an instructional strategy to encourage students to be more savvy interpreters of graphics in applied math problems. One idea is to have them apply a reading comprehension strategy, Question-Answer Relationships (QARs) as a tool for analyzing math graphics. The four QAR question types (Raphael, 1982, 1986) are as follows:

- RIGHT THERE questions are fact-based and can be found in a single sentence, often accompanied by 'clue' words that also appear in the question.
- THINK AND SEARCH questions can be answered by information in the text--but require the scanning of text and the making of connections between disparate pieces of factual information found in different sections of the reading.
- AUTHOR AND YOU questions require that students take information or opinions that appear in the text and combine them with the reader's own experiences or opinions to formulate an answer.

•ON MY OWN questions are based on the students' own experiences and do not require knowledge of the text to answer.

2. **Compass Learning**
3. **Do the Math**
4. **Accelerated Math**