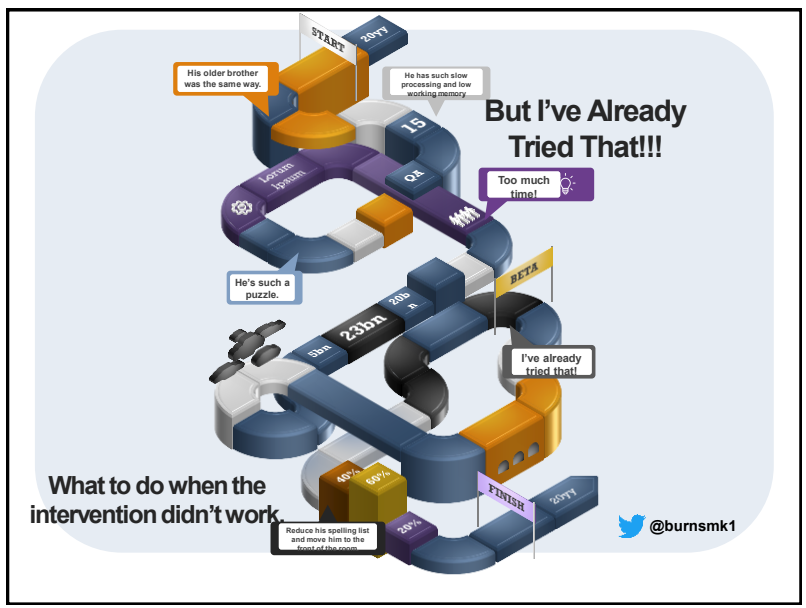

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Tier 2

Student	Measure	# of Weeks	Slope
1	WRC	20	0.25
2	WRC	12	-0.64
3	WRC	10	1.50
4	LSC	22	-0.15
5	WRC	6	3.00
6	WRC	10	-3.05
7	WRC	16	0.07
8	WRC	14	0.71
9	WRC	8	0.90
10	LSC	20	1.32
11	WRC	8	-0.25
12	WRC	18	0.11
13	WRC	18	0.44
14	WRC	6	0.00
15	LSC	22	0.29
16	LSC	14	0.82
17	LSC	12	0.23

2

Table 1
Mean Effect Sizes for Categories and Total

Variable	Mean		
	N	ES	SD
Student outcomes	45	1.15	.65
Teacher ratings	14	1.36	.61
Observed behavior	31	1.05	.66
Systemic outcomes	12	.90	.22
Design			
Random assignment	33	1.43	.49
Nonrandom assignment	24	.64	.39
University-based	41	1.32	.51
Field-based	16	.54	.41
Total	57	1.10	.60

Problem Solving Teams

Burns & Symington, 2003

3

Framework to Intensify Interventions

National Center for Intensive Interventions

4

Table 1. Summary of Meta-Analyses Regarding Cognitive Processes and Academic Interventions

STUDY	DESCRIPTION	*k*	*d*
Burns et al. (in press)	Academic interventions from cognitive processing measures	37	0.17
Kearns & Fuchs (2013)*	Academic outcomes of cognitively focused intervention	34	0.44
	Matched to cognitive deficits	5	0.48
	Compared to no intervention	11	0.58
	Compared to academic interventions	34	0.26
Melby-Lervag & Hulme, (2013)	Working memory training and academic outcomes	8	0.11
	Mathematics	7	0.07
	Decoding	7	0.13
	Verbal ability (comprehension)	8	0.13
Scholin & Burns (2012)	Predicting response to intervention for reading with IQ	18	0.27
Stuebing et al. (2009)	Relationship between IQ and academic outcomes	22	0.32
Stuebing et al. (2015)	Cognitive characteristics and response to intervention	54	0.46
	Baseline characteristics and growth curves	36	0.65
	Baseline characteristics and gain scores	30	0.43
	Baseline characteristics and posttest	54	0.30
Schwaighofer et al. (2015)	Near and far transfers for working memory training	47	0.15
	Mathematics	15	0.09
	Decoding	14	0.15
	Verbal ability (comprehension)	29	0.21
Total		**203**	**0.27**

* One effect was identified as an outlier by Kearns and Fuchs (2013) and was removed.

5

Instructional Hierarchy:
Stages of Learning

	Acquisition	Proficiency	Generalization	Adaption
Learning Hierarchy	■Slow and inaccurate	■Accurate but slow	■Can apply to novel setting	■Can use information to solve problems
Instructional Hierarchy	■Modeling ■Explicit instruction ■Immediate corrective feedback	■Novel practice opportunities ■Independent practice ■Timings ■Immediate feedback	■Discrimination training ■Differentiation training	■Problem solving ■Simulations

Haring, N. G., & Eaton, M. D. (1978). Systematic instructional procedures: An instructional hierarchy. In N. G. Haring, T. C. Lovitt, M. D. Eaton, & C. L. Hansen (Eds.) *The fourth R: Research in the classroom* (pp. 23-40). Columbus, OH: Charles E. Merrill.

6

Learning Process

Acquire

Maintain

Generalize

7

Results

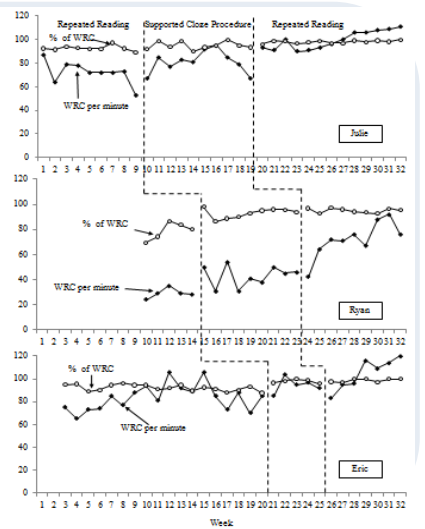

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Table 2. Strategies for Intervention Intensification (Fuchs et al., 2017) and Phases of Learning

INTENSIFICATION STRATEGY	DEFINITION	MOST APPROPRIATE PHASE IN LEARNING HIERARCHY
Dosage	Number of intervention sessions each week, number of minutes and opportunities to respond in each session, and the size of the intervention group.	*Fluency building*–A student in the fluency-building phase of learning might complete the task accurately, but then not retain it the next day. Increasing dosage helps with retaining newly learned information. *Acquisition*–Assess reading comprehension, fluency, decoding, and phonemic awareness to identify the most fundamental skill in which the student needs support and those that have already been mastered. The intervention is then matched to the skill for which the student needs support to facilitate better initial learning. *Generalization*–Providing opportunities to practice the skill across different contexts and situations enhances generalization of the skill.
Alignment for Acquisition	Intervention adequately addresses skills that the student has yet to learn while incorporating a meaningful focus on grade-appropriate standards, but does not address skills that the student has already mastered.	
Transfer for Generalization	Explicitly teaching how to transfer the skill to other forms and contexts, and to realize the connections between mastered and new skills.	
Comprehensiveness for Acquisition	Including components of direct instruction such as using simple and direct language, increasing modeling of the skill, building background knowledge before teaching, and incorporating systematic cumulative reviews.	*Acquisition*–Modeling and explicit instruction are strategies appropriate for the acquisition phase of learning.

9

Problem Analysis

- At the end of the lesson, can the kid do it? (Learn it in the first place?)
- If the kid learns it, does she remember it the next day?
- If she remembers it, can she apply or use it?

10

Problem Analysis

At the end of the lesson, can the kid do it? (Learn it in the first place?)

Accuracy at end of lesson ≥ 90%

If the kid learns it, does she remember it the next day?

Accuracy at end of lesson ≤ 90%	Scores low on retention measure

If she remembers it, can she apply or use it?

Accuracy at end of lesson ≤ 90%	Scores high on retention measure

11

Acquire

Validated protocol – different target – back it up!

Adaption - Acquisition rate or make stimuli more salient and errorless

Retain

Validated protocol - Increased repetition within lesson (IR)

Adaption - Increased repetition across lessons or frequent review

Generalize

Validated protocol – comprehension or application interventions

Adaption - Integrate a variety of forms of the letters, words, numbers etc., into intervention sessions

12

Acquire – Not learning it in the first place

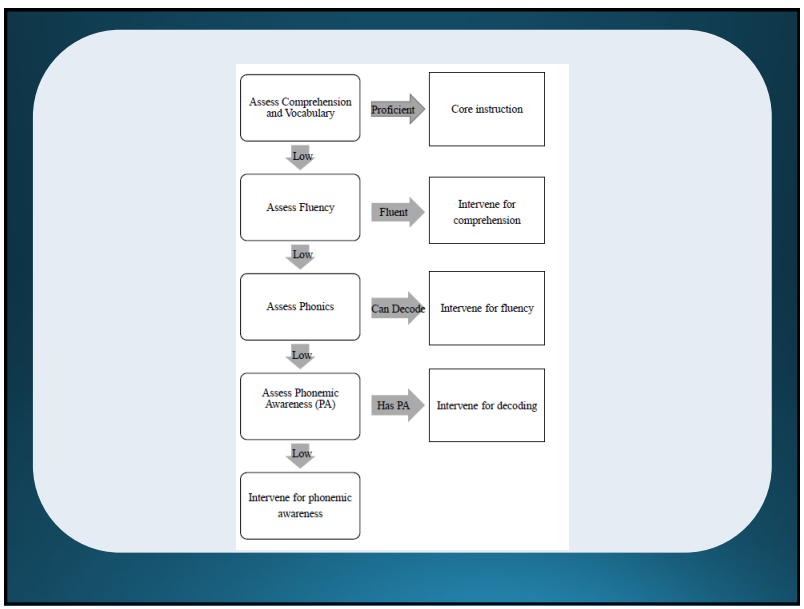
Validated Program – Right Target

Modification – Errorless and Salient

13

Right Target?

14



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Grade	Phonemic Awareness	Phonics	Fluency	Comprehension
Kindergarten	Road to the Code	Sound Partners	NA	NA
First Grade	Road to the Code	Sound Partners	NA	NA
Second Grade	Intervention for All: Phonological Awareness	Sound Partners	Six Minute Solution or Read Naturally	Reciprocal Teaching
Third Grade	Intervention for All: Phonological Awareness	Reading Mastery	Six Minute Solution or Read Naturally	Reciprocal Teaching
Fourth Grade	NA	REWARDS	Six Minute Solution or Read Naturally	Reciprocal Teaching
Fifth Grade	NA	REWARDS	Six Minute Solution or Read Naturally	Reciprocal Teaching

16

Math

Conceptual Understanding

17

Please use the dots below the two problems to decide which of the two problems is right and circle the math problem that is right

1. 2 + 4 = 6 2 + 4 = 8

2. 4 + 1 = 7 4 + 1 = 5

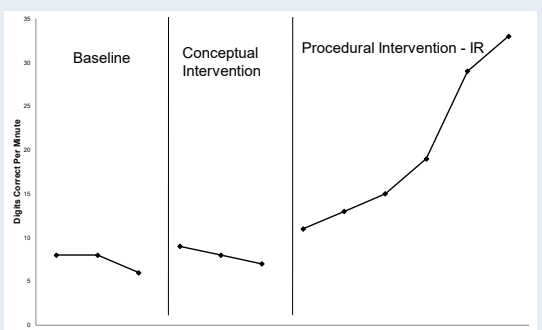
3. 6 + 3 = 11 6 + 3 = 9

4. 5 + 2 = 7 5 + 2 = 9

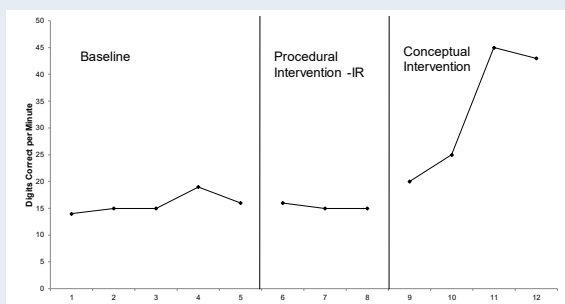
5. 4 + 6 = 8 4 + 6 = 10

6. 3 + 2 = 5 3 + 2 = 7

18


Baseline
Conceptual Intervention
Procedural Intervention - IR
Digits Correct Per Minute

19


Baseline
Procedural Intervention -IR
Conceptual Intervention
Digits Correct per Minute

20

TABLE 2 Definitions of mathematical strands of proficiency

Strands of proficiency	Intervention criterion
Conceptual understanding	Fosters the developmental knowledge of relationships and ideas related to the problem.
Procedural knowledge	Fosters the developmental understanding of the rote steps needed to solve a problem.
Strategic competence	Fosters the development of learning to solve problems using multiple strategies.
Adaptive reasoning	Fosters the development of learning to justify the correct answer and demonstrate reasoning.
Productive disposition	Fosters the development of viewing mathematics as useful and worthwhile, while increasing students' confidence.

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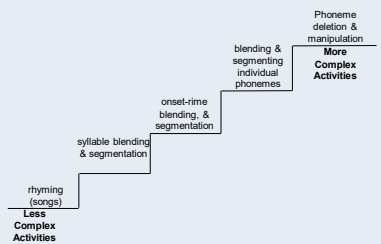
TABLE 3 Application of mathematical proficiency strands to mathematical interventions

	Mathematical proficiency strands				
Intervention	Conceptual understanding	Procedural knowledge	Strategic competence	Adaptive reasoning	Productive disposition
Cognitive strategy instruction	X	X	X	X	
Concrete-representational-abstract	X	X	X	X	
Contingent reinforcement					X
Cover, copy, compare		X			
Explicit instruction	X	X	X		
Feedback				X	
Flashcard interventions		X			
Goal setting					X
Great leaps	X				X
Math to mastery		X			X
Mnemonic instruction		X			
Modeling	X	X			
Parental involvement					X
Peer-assisted learning strategies	X	X		X	X
Schema-based instruction	X	X	X	X	
Self-monitoring				X	X
Self-regulated learning				X	X
Taped problems		X			
Think alouds	X			X	

22

- Decoding rather than fluency? PA rather than decoding?
- Within domain?
  - Easier text
  - Decoding inventory
  - Math objective



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Acquire – Not learning it in the first place

Validated Program – Right Target

Modification – Errorless and Salient

24

25

Errorless - Listening Passage Preview

Select	Select a passage to student that he/she will read for class
Present	Present the text and tell him or her that you will read aloud while he or she follows along. This will help him or her read the page better.
Tell	Tell the student to follow along with finger
Read	Read the text at a comfortable rate while monitoring if child is following
Have	Have the student read the passage aloud

26

Errorless - Phrase Drill

- Encourages words by word reading
- Strong error correction technique
- Likely to generalize learned words
- Takes more time than other approaches to error correction

27

Retention – Not remembering what was learned

Validated Program – Increase repetition within session

- Incremental Rehearsal
- Repeated Reading
- Word Sorts

Modification – Increase repetition across sessions

- Pocket words
- Recall practice effect

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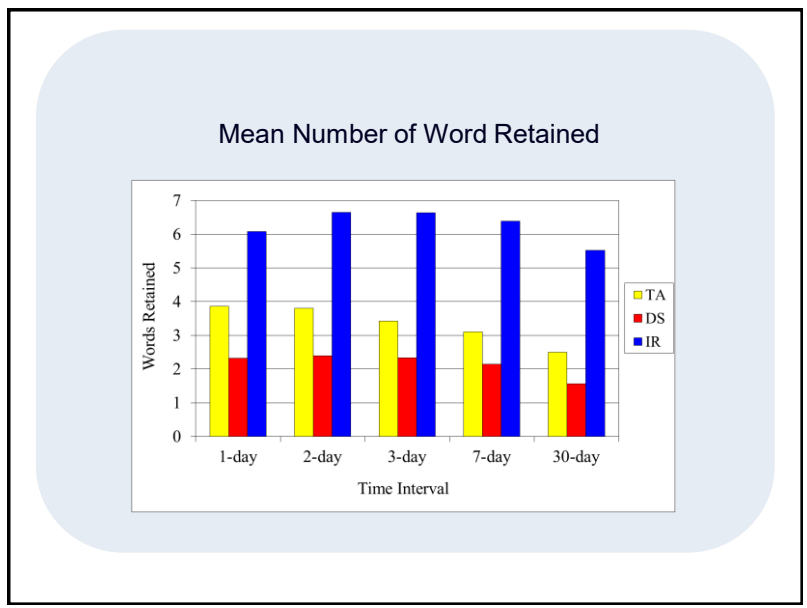
Incremental Rehearsal

- Developed by Dr. James Tucker (1989)
- Folding in technique
- Rehearses one new item at a time
- Uses instructional level and high repetition

29



30

Incremental Rehearsal Effectiveness

Bunn, R., Burns, M. K., Hoffman, H. H., & Newman, C. L. (2005). Using incremental rehearsal to teach letter identification with a preschool-aged child. *Journal of Evidence Based Practice for Schools, 6,* 124-134.

Burns, M. K. (2007). Reading at the instructional level with children identified as learning disabled: Potential implications for response–to-intervention. *School Psychology Quarterly,* 22, 297-313.

Burns, M. K. (2005). Using incremental rehearsal to practice multiplication facts with children identified as learning disabled in mathematics computation. *Education and Treatment of Children, 28,* 237-249.

Burns, M. K., Dean, V. J., & Foley, S. (2004). Preteaching unknown key words with incremental rehearsal to improve reading fluency and comprehension with children identified as reading disabled. *Journal of School Psychology, 42,* 303-314.

Codding, R. S., Archer, J., & Connell, J. (2010). A systematic replication and extension of using incremental rehearsal to improve multiplication skills: An investigation of generalization. *Journal of Behavioral Education, 19,* 93-105.

Matchett, D. L., & Burns, M. K. (2009). Increasing word recognition fluency with an English language learner. *Journal of Evidence Based Practices in Schools, 10,* 194-209.

Nist, L. & Joseph L. M. (2008). Effectiveness and efficiency of flashcard drill instructional methods on urban first-graders' word recognition, acquisition, maintenance, and generalization. *School Psychology Review, 37,* 294-208.

Peterson, M., Brandes, D., Kunkel, A., Wilson, J., Rahn, N., Egan, A., & McComas, J. J. (2014). Teaching letter sounds to kindergarten English language learners using Incremental Rehearsal. *Journal of School Psychology, 52,* 97-107.

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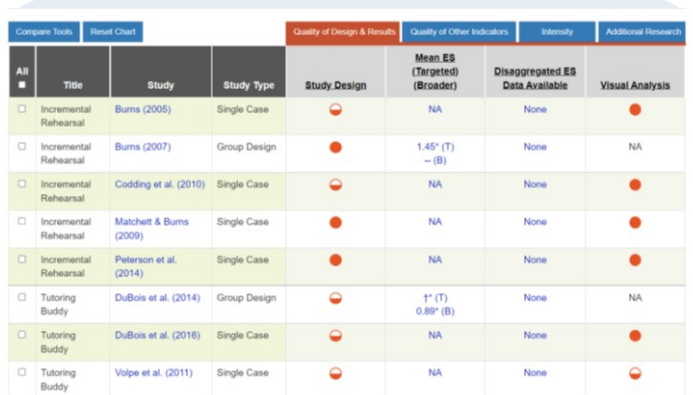

Compare Tools | Reset Chart | Quality of Design & Results | Quality of Other Indicators | Intensity | Additional Research

All ■	Title	Study	Study Type	Study Design	Mean ES (Targeted) (Broader)	Disaggregated ES Data Available	Visual Analysis
☐	Incremental Rehearsal	Burns (2005)	Single Case	◒	NA	None	●
☐	Incremental Rehearsal	Burns (2007)	Group Design	●	1.45* (T) -- (B)	None	NA
☐	Incremental Rehearsal	Codding et al. (2010)	Single Case	◒	NA	None	●
☐	Incremental Rehearsal	Matchett & Burns (2009)	Single Case	●	NA	None	●
☐	Incremental Rehearsal	Peterson et al. (2014)	Single Case	●	NA	None	●
☐	Tutoring Buddy	DuBois et al. (2014)	Group Design	◒	†* (T) 0.89* (B)	None	NA
☐	Tutoring Buddy	DuBois et al. (2016)	Single Case	◒	NA	None	●
☐	Tutoring Buddy	Volpe et al. (2011)	Single Case	◒	NA	None	◒

32

Repeated Readings

- One of the oldest and most well-researched interventions
- High OTR
- Generalizes to passage and similar ones

33

Repeated Reading

Objective: To increase fluent reading on passages for students who
- read with high accuracy
- show benefit from repeated practice on the same passage

Materials: 2 copies each of texts that the student can read with at least 95% accuracy
Stop-watch
Pencil/pen for teacher to mark errors

34

Sequence:

1. Teacher explains that students will be reading a passage multiple times to work on increasing fluency (fluency is rate and accuracy and expression – not just speed)
2. Teacher gives copies of passages to student
3. (Optional Step) Student whisper reads passage to him/herself while tracking with his/her finger to figure out unknown words. Students may ask about any unknown words.
4. Teacher explains that for the first reading out-loud, the student will read for 1 minute.
5. Teacher says "Begin" (not "Start") and starts stop-watch.
6. Student reads passage out-loud.
7. Teacher marks errors and monitors stopwatch. At one minute, teacher says "Stop" and marks the last word read by the student.
8. Teacher records number of correct words per minute and graphs results, showing the graph to the student.
9. Teacher provides standard error correction for each word the student read in error. ("That word is _____. What word?" The student repeats the word. Teacher says, "Yes. That word is _____." Student goes back to the beginning of the sentence to begin again.)
10. Repeat steps 5-9 at least two more times for a minimum of 3 timed readings (student reads, teacher times, words read correctly are recorded, and errors are corrected). Additional repetitions may be completed if student's fluency continues to improve through these readings.

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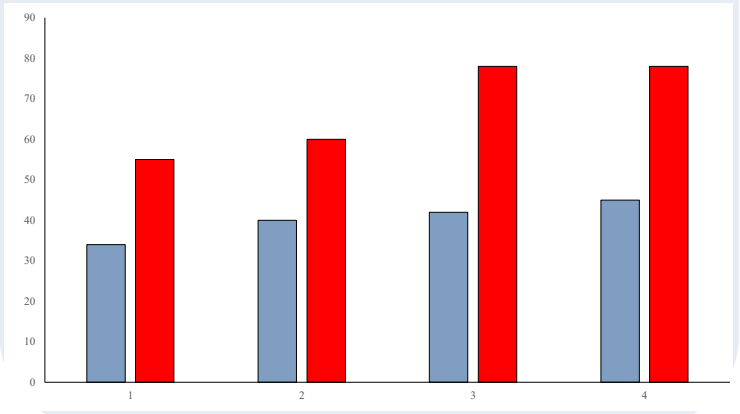

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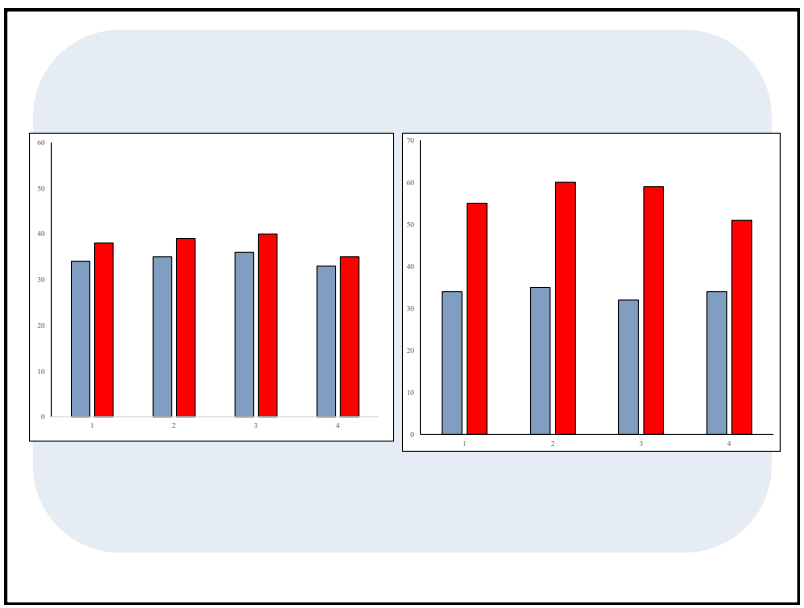

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Increase number of reads for repeated reading

More examples in word sorts

More items in C-C-C and practice sheets

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Retention – Not remembering what was learned

Validated Program – Increase repetition within session

- Incremental Rehearsal
- Repeated Reading
- Word Sorts

Modification – Increase repetition across sessions

- Pocket words
- Recall practice effect

39

Retention Intervention

- Short sessions
- Twice per day
- Test retention at the end of each day
- Start with review

40

Generalization – Not applying what was learned

Validated Program

Concept Map
Reciprocal Teaching
Schema-based Instruction

Modification – Teach how you want them to use it

41

Comprehension is affected by

1 & 2) Background knowledge and vocabulary

3) Correct inferences about reading

4) Word reading skill

5) Strategy use

(Cromley & Azevedo, 2007)

42

Schema-based Instruction

Based on schema theory

Instructional approach for teaching problem-solving

Problem types for addition/subtraction
- Change
- Group
- Compare

Students are explicitly taught how to identify, organize, plan, and solve various word problem types

Diagrams are systematically faded

43

Say-Ask-Check (Montague, 1992)

Steps	Prompt Sample
1. Read	I will read the problem and reread what I don't understand. Do I fully understand it?
2. Paraphrase	I will highlight key words and restate it in my own words. Did I highlight the most important words?
3. Draw	I will draw a picture of the problem. Does the drawing contain the important parts?
4. Plan	I will make a plan to solve the problem. What is the first step? What is the second step?
5. Predict	I will predict what I think the answer is. What numbers should be used to estimate?
6. Compute	I will compute the answer. Does my answer sound right?
7. Check	I will check the steps of my answer. Did I go through each step and check my work?

44

CASE # 4

Name:	Christine
Grade:	Fourth
Gender:	Female
Race/Ethnicity:	White
Reason for referral:	Christine was referred due to reported difficulties with reading. Her most recent screeners (Aimsweb and Star) were all below benchmark criteria. Her teacher reported difficulty with reading comprehension, but decoding and fluency were rated as acceptable.
Diagnostic Data:	Aimsweb R-CBM = 15 words per minute Accuracy = 15 out of 20 (75%) STAR Reading = 10th percentile DIBELS NWF = 40 out of 52 (goal = 56) (77%) Phonemic Awareness subtest of CTOPP = SS 98 (45th percentile) Average daily word assessments (from sounds taught that day) – 9.3/10
Intervention:	Decoding four times per week for 8 weeks.

Progress monitoring with R-CBM

Week	1	2	3	4	5	6	7	8	SLOPE
Score	15	18	17	21	20	22	19	21	0.72619

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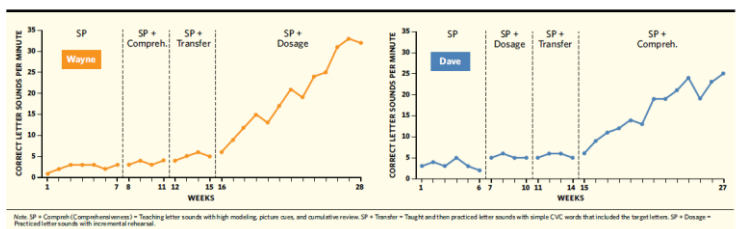
Figure 1. Progress Monitoring Data From Weekly Nonsense Word Fluency Measures for Sound Partners (SP) and Intensifications



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Tier 2

Student	Measure	# of Weeks Pre BEA	Pre BEA Slope	# of Weeks Post-BEA	Post BEA Slope	Change in Slope
1	WRC	20	0.25	2	8.00	7.75
2	WRC	12	-0.64	8	0.55	1.19
3	WRC	10	1.50	14	1.68	0.18
4	LSC	22	-0.15	8	0.12	0.26
5	WRC	6	3.00	8	3.43	0.43
6	WRC	10	-3.05	9	3.03	6.08
7	WRC	16	0.07	7	0.46	0.39
8	WRC	14	0.71	9	2.78	2.07
9	WRC	8	0.90	8	1.06	0.16
10	LSC	20	1.32	2	8.00	6.68
11	WRC	8	-0.25	12	0.08	0.33
12	WRC	18	0.11	6	1.77	1.66
13	WRC	18	0.44	6	3.03	2.59
14	WRC	6	0.00	6	-0.40	-0.40
15	LSC	22	0.29	9	1.08	0.80
16	LSC	14	0.82	7	2.93	2.11
17	LSC	12	0.23	8	2.52	2.30

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