

TIER III – Math Matthew Burns

Remember Algebra

- Logical patterns exist and can be found in many different forms.
- Symbolism is used to express generalizations of patterns and relationships.
- Use equations and inequities to express relationships.
- Functions are a special type of relationship (e.g., one-more-than).

VandeWalle, 2008

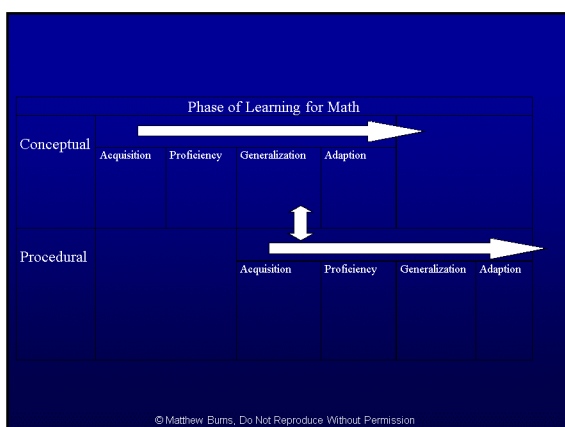
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	Acquisition	Proficiency	Generalization	Adaption
Learning Hierarchy	<ul style="list-style-type: none"> ■ Slow and inaccurate 	<ul style="list-style-type: none"> ■ Accurate but slow 	<ul style="list-style-type: none"> ■ Can apply to novel setting 	<ul style="list-style-type: none"> ■ Can use information to solve problems
Instructional Hierarchy	<ul style="list-style-type: none"> ■ Modeling ■ Explicit instruction ■ Immediate corrective feedback 	<ul style="list-style-type: none"> ■ Novel practice opportunities ■ Independent practice ■ Timings ■ Immediate feedback 	<ul style="list-style-type: none"> ■ Discrimination training ■ Differentiation training 	<ul style="list-style-type: none"> ■ 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.

Instructional Hierarchy for Conceptual Knowledge				
Phase of Learning	Acquisition	Proficiency	Generalization	Adaption
Examples of appropriate instructional activities	Explicit Instruction in basic principles and concepts	Independent practice with manipulatives	Instructional games with different stimuli	Use concepts to solve applied problems
	Modeling with math manipulatives	Immediate feedback on the speed of responding, but delayed feedback on the accuracy.	Provide word problems for the concepts	
	Immediate corrective feedback	Contingent reinforcement for speed of response.		

Instructional Hierarchy for Procedural Knowledge				
Phase of Learning	Acquisition	Proficiency	Generalization	Adaption
Examples of appropriate instructional activities	Explicit instruction in task steps	Independent practice with written skill	Apply number operations to applied problems	Use numbers to solve problems in the classroom
	Modeling with written problems	Immediate feedback on the speed of the response, but delayed feedback on the accuracy.	Complete real and contrived number problems in the classroom	
	Immediate feedback on the accuracy of the work.	Contingent reinforcement		



Skill by Treatment Interaction

- Instructional Level (Burns, VanDerHeyden, & Jiban, 2006)
- 2nd and 3rd grade -14 to 31 Digits Correct/Min
- 4th and 5th grade - 24 to 49 Digits Correct/Min













Type of Intervention	Baseline Skill Level	k	Median PND	Mean Phi
Acquisition	Frustration	21	97%	.84
	Instructional	15	66%	.49
Fluency	Frustration	12	62%	.47
	Instructional	NA		

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Conceptual Assessment

- Ask students to judge if items are correct
 - 10% of 5-year-old children who correctly counted did not identify counting errors in others (Briars & Siegler, 1984).
- Provide three examples of the same equation and asking them to circle the correct one
- Provide a list of randomly ordered correct and incorrect equations and ask them to write or circle "true" or "false" (Beatty & Moss, 2007).

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. $2 + 4 = 8$
2. $4 + 1 = 7$			4. $4 + 1 = 5$
3. $6 + 3 = 11$			6. $6 + 3 = 9$
4. $5 + 2 = 7$			5. $5 + 2 = 9$
5. $4 + 6 = 8$			4. $4 + 6 = 10$
6. $3 + 2 = 5$			3. $3 + 2 = 7$

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Conceptual Intervention

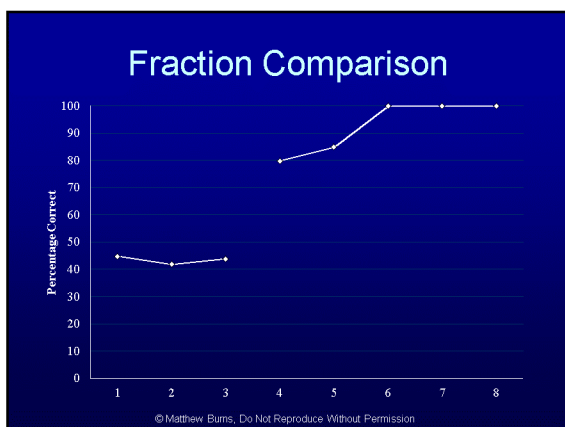
- John – 8th grade African-American female
- History of math difficulties (6th percentile)
- Could not learn fractions

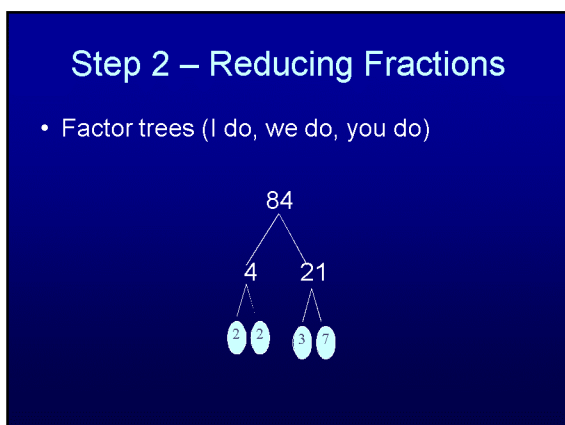
Assessment

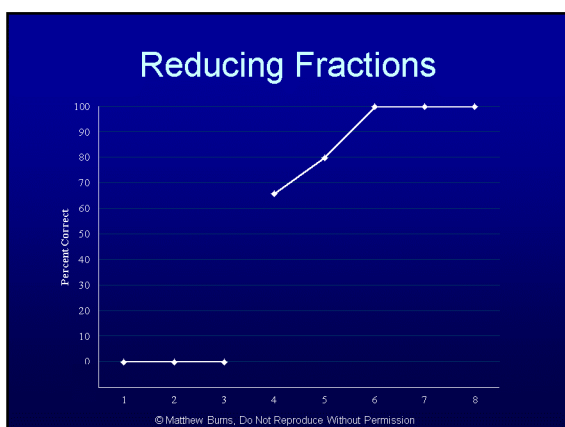
- 0 correct on adding fractions probe
- Presented sheet of fractions with two in each problem and asked which was larger (47% and 45% correct)
- 0% reducing

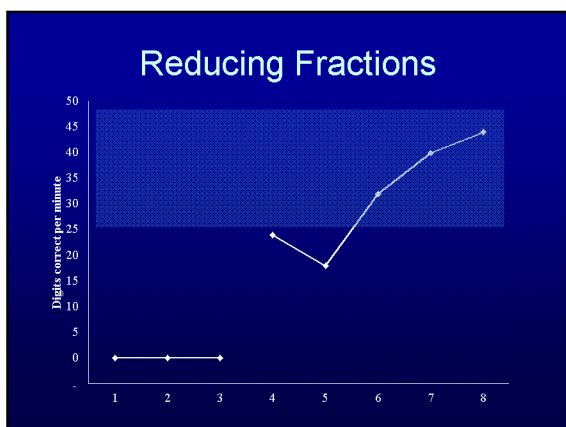
Step 1 – size of fractions

- 1. I do
- 2. We do
- 3. You do
- Comparing fractions with pie charts









Conceptual Assessment

Problem 1
Please use a picture to solve the problem

3 x 4 = ____

Problem 2
Please use a picture to solve the problem

5 x 6 = ____

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Problem 1
Please use a picture to solve the problem

2 x 4 = ____

00 x 0000 = 8

Problem 2
Please use a picture to solve the problem

3 x 5 = ____

U U U x 00000 = 15

Ratings for Problem 2

- Counts with understanding 4
- Understands number sign 3
- Understands the facts of adding/
subtraction or multiplication/division
of whole numbers 3
- Uses visual model (Correct relationship
between diagram and problem) 2
- Uses an identifiable strategy 1
- Answers the problem correctly 4

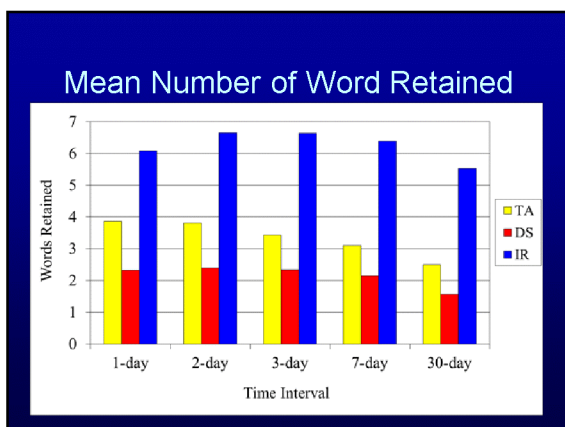
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From Objects to Numbers

- Make Sets
- Count the number write the number
- Part-Part-Whole
- Fill the Chutes
- Broken Calculator Key
- Algebra – Pattern Match
- Algebra – Tilt or Balance

Incremental Rehearsal

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



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., & Boice, C. H. (2009). Comparison of the relationship between words retained and intelligence for three instructional strategies among students with low IQ. *School Psychology Review, 38*, 284-292.

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.

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.

What about Touch Math???

