Supplemental Handouts

Maximize ALL Students' Mathematical Learning in Through the Use of Powerful Instructional Strategies & Techniques

January 18, 2017
February 16, 2017
March 1, 2017

Presented by:

Dr. Paul J. Riccomini
pjr146@psu.edu

@pjr146

Breakout Activity #1

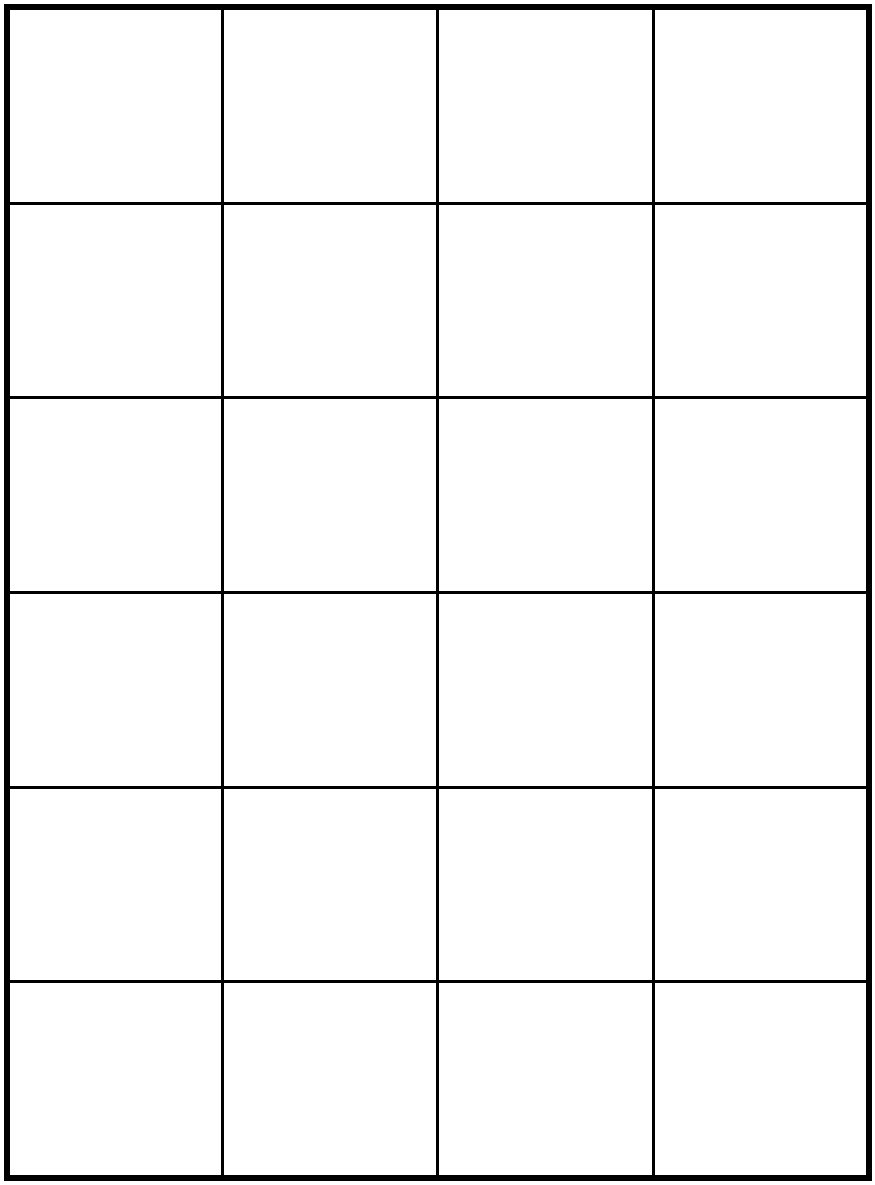
Discuss the key issues in mathematics impacting your students who struggle and those with disabilities and why it is a key issue. Prioritize the key issues using the sheet below. Remember to discuss any and all key issues impacting how you teach math, classroom type (inclusive, co-taught, tier 2, supplemental), how you assess student performance, curriculum, etc.

1.
2.
3.
4.

pjr146@psu.edu

Breakout Activity #1a

Our Own Fraction Foundations



pjr146@psu.edu

Breakout Activity #1b
Fractions and the Number line

Discuss your current curricular materials in relationship to the use of the number line to represent fractions, decimals, and percents.

1. Is the # line a common representation?
2. Are fractions and decimals ever displayed together on a # line representation?
3. How often are students exposed to the number line with fractions?
4. What types of activities involve the # line?
5. Where can the # line be used more frequently in your math lessons?
6. Whole group, small group centers or stations, Intervention Time, and other?

NOTES:

pjr146@psu.edu

Handout 1c

National Math Panel
March 2008

To compete in the 21st century global economy, knowledge of and proficiency in mathematics is critical. Today's high school graduates need to have solid mathematics skills—whether they are headed for college or the workforce. To help ensure our nation's future competitiveness and economic viability, President George W. Bush created the National Mathematics Advisory Panel (National Math Panel) in April 2006.

The panel was charged with providing recommendations to the President and U.S. Secretary of Education Margaret Spellings on the best use of scientifically based research to advance the teaching and learning of mathematics. Expert panelists, including a number of leading mathematicians, cognitive psychologists, and educators, reviewed numerous research studies before preparing a final report containing guidance on how to improve mathematics achievement for all students in the United States.

The National Math Panel's final report, issued on March 13, 2008, contains 45 findings and recommendations on numerous topics including instructional practices, materials, professional development, and assessments. Highlights from the report are briefly summarized below. Please visit www.ed.gov/MathPanel for the executive summary and full report.

Core Principles of Math Instruction

- The areas to be studied in mathematics from pre-kindergarten through eighth grade should be streamlined and a well-defined set of the most important topics should be emphasized in the early grades. Any approach that revisits topics year after year without bringing them to closure should be avoided.
- Proficiency with whole numbers, fractions, and certain aspects of geometry and measurement are the foundations for algebra. Of these, knowledge of fractions is the most important foundational skill not developed among American students.
- Conceptual understanding, computational and procedural fluency, and problem solving skills are equally important and mutually reinforce each other. Debates regarding the relative importance of each of these components of mathematics are misguided.
- Students should develop immediate recall of arithmetic facts to free the "working memory" for solving more complex problems.
- The benchmarks set forth by the Panel should help to guide classroom curricula, mathematics instruction, textbook development, and state assessments.
- More students should be prepared for and offered an authentic algebra course at Grade 8.
- Algebra should be consistently understood in terms of the "Major Topics of School Algebra," as defined by the National Math Panel.
- The Major Topics of School Algebra include Symbols and Expressions; linear equations; quadratic equations; functions; algebra of polynomials; and combinatorics and finite probability.

pjr146@psu.edu

Student Effort Is Important

Much of the public's "resignation" about mathematics education is based on the erroneous idea that success comes from inherent talent or ability in mathematics, not effort. A focus on the importance of effort in mathematics learning will improve outcomes. If children believe that their efforts to learn make them "smarter," they show greater persistence in mathematics learning.

Importance of Knowledgeable Teachers

- Teachers' mathematical knowledge is important for students' achievement. The preparation of elementary and middle school teachers in mathematics should be strengthened. Teachers cannot be expected to teach what they do not know.
- The use of teachers who have specialized in elementary mathematics teaching could be an alternative to increasing all elementary teachers' mathematics content knowledge by focusing the need for expertise on fewer teachers.

Effective Instruction Matters

- Teachers' regular use of formative assessments can improve student learning in mathematics.
- Instructional practice should be informed by high-quality research, when available, and by the best professional judgment and experience of accomplished classroom teachers.
- The belief that children of particular ages cannot learn certain content because they are "too young" or "not ready" has consistently been shown to be false.
- Explicit instruction for students who struggle with math is effective in increasing student learning. Teachers should understand how to provide clear models for solving a problem type using an array of examples, offer opportunities for extensive practice, encourage students to "think aloud," and give specific feedback.
- Mathematically gifted students should be allowed to accelerate their learning.
- Publishers should produce shorter, more focused and mathematically accurate mathematics textbooks. The excessive length of some U.S. mathematics textbooks is not necessary for high achievement.

Effective Assessment

The National assessment of Educational Progress (NAEP) and state assessments in mathematics should be improved in quality and should emphasize the most critical knowledge and skills leading to Algebra.

Importance of Research

The nation must continue to build the capacity for more rigorous research in mathematics education to inform policy and practice more effectively.

For more information, please visit www.ed.gov/mathpanel.

pjr146@psu.edu

Who Struggles in Math
(Handout #2)

Activity One:

Write the numeral next to its appropriate symbol. Use the key as a guide.

3 = ## 5 = ### 6 = <>###

The answers may be 1, 2, 4, 7, 8, 9, or 10

a. <>#### _____
b. <> _____
c. ##### _____
d. # _____
e. <><> _____
f. <>## _____
g. <>##### _____
h. <># _____
i. #### _____

Witzel, B., & Riccomini, P. J. (2004, July). Assessment-based effective instruction in mathematics: A training manual for teachers of students with high-incidence disabilities. *The Effective Teacher, Inc.*

pjr146@psu.edu

Who Struggles in Math
(Handout #3)

Activity Two:

Solve as many problems as you can in one minute.

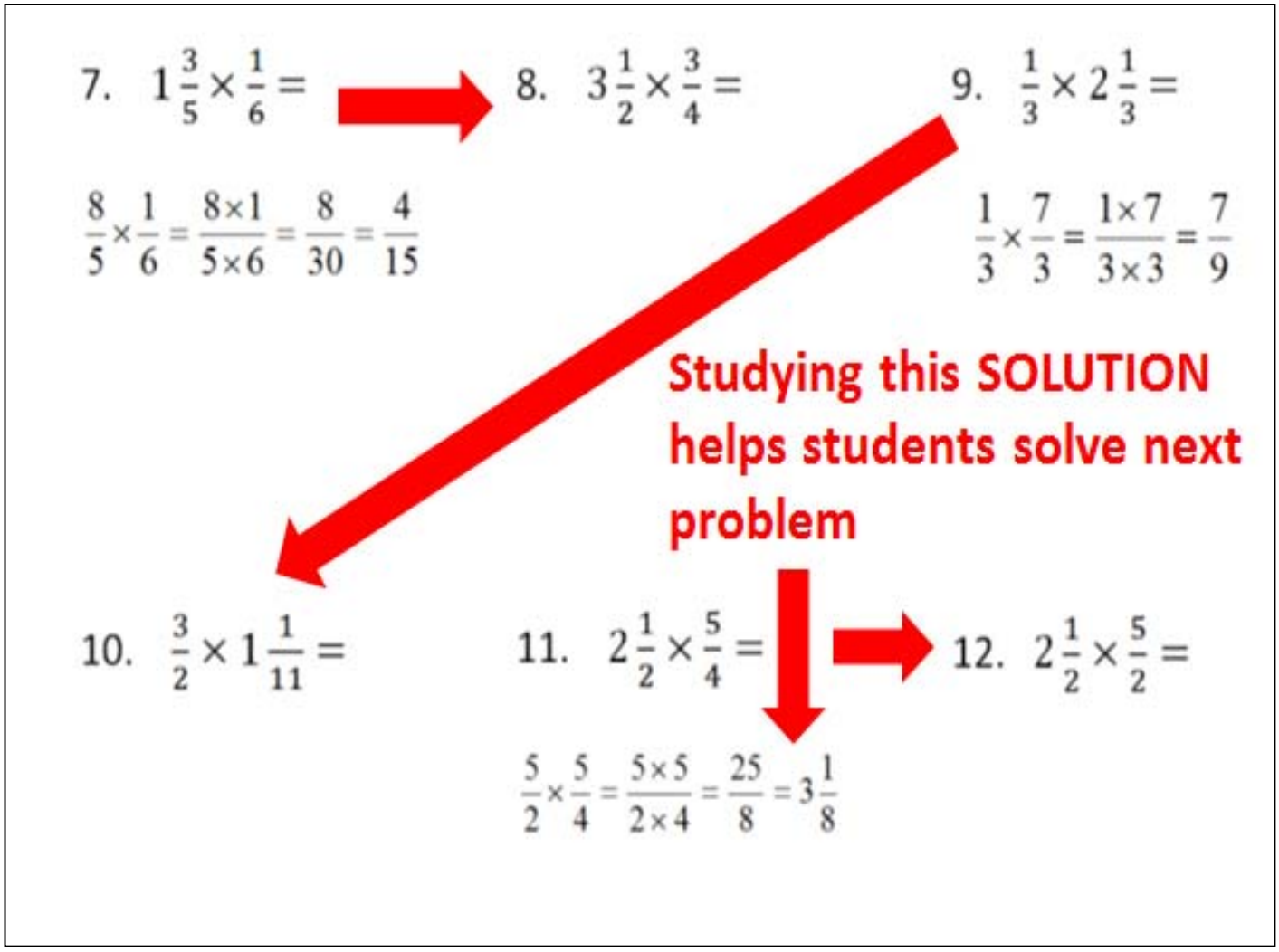
Remember to write clearly and circle your answers. Do not skip any questions as the answers will count against your total. For the addition sign, subtract, for multiplication divide, for subtraction multiply, and division add.

4 x 2	4 – 3
7 + 5	8 x 2
11 - 3	8 / 4
32 / 8	6 + 2
8 x 4	8 – 3
5 + 8	5 / 5
9 – 8	4 x 2
24 / 8	3 + 8
3 x 3	5 – 2
2 + 4	6 / 3
6 – 7	6 x 3
81 / 9	7 – 1
9 x 3	7 + 5
9 – 2	
4 + 1	
15 / 3	

Witzel, B., & Riccomini, P. J. (2004, July). Assessment-based effective instruction in mathematics: A training manual for teachers of students with high-incidence disabilities. *The Effective Teacher, Inc.*

pjr146@psu.edu

IWSS Strategy Example
Handout #4a



pjr146@psu.edu

IWSS Example Practice Sheet
Handout #4b

WRITING EQUATIONS IN SLOPE-INTERCEPT FORM GIVEN TWO POINTS

Write an equation in slope-intercept form of the line that passes through the given points.

Ex. (1, 6) and (8, -1)

$\frac{-1-6}{8-1} = \frac{-7}{7} = -1$

$y - 6 = -1(x - 1)$

$y - 6 = -1x + 1$
$+6 \qquad +6$
$y = -1x + 7$

1. Find slope.
2. Choose one ordered pair and substitute it into point-slope formula with the slope.
3. Put into slope-intercept form by:
   - → distributing
   - → adding or subtracting
4. Final answer – equation written in slope-intercept form.

1. (-3, 9) and (0, 3)

$\frac{3-9}{0-(-3)} = \frac{-6}{3} = -2$
$y - 9 = -2(x - (-3))$
$y - 9 = -2(x + 3)$
$y - 9 = -2x - 6$
$+9 \qquad +9$
$y = -2x + 3$

2. (1, 2) and (2, 3)

3. (0, 0) and (2, 6)

4. (3, 1) and (2, 6)

$\frac{6-1}{2-3} = \frac{5}{-1} = -5$
$y - 1 = -5(x - 3)$
$y - 1 = -5x + 15$
$+1 \qquad +1$
$y = -5x + 16$

5. (4, -1) and (2, -2)

$\frac{-2-(-1)}{2-4} = \frac{-2+1}{-2} = \frac{-1}{-2} = \frac{1}{2}$
$y - (-1) = \frac{1}{2}(x - 4)$
$y + 1 = \frac{1}{2}(x - 4)$
$y + 1 = \frac{1}{2}x - 2$
$-1 \qquad -1$
$y = \frac{1}{2}x - 3$

6. (8, -3) and (6, -2)

pjr146@psu.edu

IWSS Example Practice Sheet
Handout #4b

7. (4, -2) and (-4, -4)

8. (-4, 3) and (0, 4)

$\frac{4-3}{0-(-4)} = \frac{1}{0+4} = \frac{1}{4}$

$y - 3 = \frac{1}{4}(x - (-4))$

$y - 3 = \frac{1}{4}(x + 4)$

$y - 3 = \frac{1}{4}x + 1$

$+3 \qquad +3$

$y = \frac{1}{4}x + 4$

9. (-4, -2) and (-3, 5)

$\frac{5-(-2)}{-3-(-4)} = \frac{5+2}{-3+4} = \frac{7}{1} = 7$

$y - (-2) = 7(x - (-4))$

$y + 2 = 7(x + 4)$

$y + 2 = 7x + 28$

$-2 \qquad -2$

$y = 7x + 26$

10. (-4, 0) and (1, 5)

11. (0, 1) and (-3, -3)

12. (2, 5) and (0, -4)

$\frac{-4-5}{0-2} = \frac{-9}{-2} = \frac{9}{2}$

$y - 5 = \frac{9}{2}(x - 2)$

$y - 5 = \frac{9}{2}x - \frac{18}{2}$

$y - 5 = \frac{9}{2}x - 9$

$+5 \qquad +5$

$y = \frac{9}{2}x - 4$

Write the steps used to write the equation.

(5, 5) and (0, 2)

$\frac{2-5}{0-5} = \frac{-3}{-5} = \frac{3}{5}$

$y - 5 = \frac{3}{5}(x - 5)$

$y - 5 = \frac{3}{5}x - \frac{15}{5}$

$y - 5 = \frac{3}{5}x - 3$

$+5 \qquad +5$

$y = \frac{3}{5}x + 2$

pjr146@psu.edu

IWSS Example Practice Sheet
Handout #4c

~ Solving Equations with Variables on Both Sides ~

Name: _____ Date: _____

Directions: Verbally talk through each solution problem. Solve each unsolved problem. Use the solution problems for guidance. REMEMBER: DO NOT skip talking through the solution problems. Think back to the model and practice we did in class. Use these solution problems to think about the important steps in solving equations that sometimes have variables on both sides.

1. $25 + z = 50$
$-25 \quad -25$
$z = 25$

2. $z + 15 = 38$

3. $9x + 3 = 8x + 19$
$-8x - 3 = -8x - 3$
$x = 16$

4. $5y + 10 = 4y + 16$

5. $15 - x = 4x$
$+x = +x$
$\frac{15}{5} = \frac{5x}{5}$
$3 = x$
$x = 3$

6. $21 - x = 6x$

7. $6x + 3 = 2x + 27$
$-2x - 3 = -2x - 3$
$\frac{4x}{4} = \frac{24}{4}$
$x = 6$

8. $5y - 3 = 3y + 5$

9. $3z + 5 + 2z = 12 + 4z$
$5z + 5 = 12 + 4z$
$-4z - 5 = -5 - 4z$
$z = 7$

10. $3x + 2x = 12 - x$

pjr146@psu.edu

Using Worked out Examples in Class
Handout #4d

Annotate the worked out problem:

Solve for x in this equation:

$$3^{4x+3} = 81$$

$$3^{4x+3} = 81$$
$$3^{4x+3} = 3^4$$
$$4x + 3 = 4$$
$$4x = 1$$
$$x = \frac{1}{4}$$

How would this type of activity look like in your classroom?

pjr146@psu.edu

Essential Questions for Solutions
HO#4e

Objective 2: Factor quadratic expressions.		
$2x^2 - 16x + 32$	$2x^2 - 16x + 32$ $2(x^2 - 8x + 16)$ $2(x - 4)(x - 4)$ $2(x - 4)^2$	What did Jada do first? Can you explain why she did this first? Why did Jada factor out a 2? Can anyone think of a different way to factor this expression? How might Jada check her answer?
Objective 3: Solve quadratic equations by completing the square.		
$x^2 + 8x = 9$	$x^2 + 8x = 9$ $x^2 + 8x + 16 = 9 + 16$ $(x + 4)^2 = 25$ $x + 4 = \pm 5$	Why did Jada add 16 to both sides?
	$x + 4 = 5 \quad x + 4 = -5$ $x = 5 - 4 \quad x = -5 - 4$ $x = 1 \quad x = -9$	Why are there two solutions to this equation?
	Verify my solution: $(1)^2 + 8(1) = 9$ $1 + 8 = 9$ $9 = 9$ ✓ $(-9)^2 + 8(-9) = 9$ $81 + (-72) = 9$ $9 = 9$ ✓	Are Jada's solutions correct? How do we know that Jada did not make any errors? How can we tell whether Jada made any mistakes in reasoning? Can anyone think of a different way of solving this equation?

pjr146@psu.edu

Correct and Incorrect Comparisons through Worked out Solutions
HO #4f

Factor: $x^2 - 10x - 24$		
Correct solved problem	**Incorrect solved problem: Sum of the integers does not equal the middle term**	**Incorrect solved problem: Sum of the integers does not equal the middle term**
Student A factored this expression correctly: $x^2 - 10x - 24$ $(x - 12)(x + 2)$	Student B did *not* factor this expression correctly: $x^2 - 10x - 24$ $(x - 4)(x + 6)$	Student C did *not* factor this expression correctly: $x^2 - 10x - 24$ $(x + 12)(x - 2)$

Sample questions to guide discussion of the errors:

1. How can you show that the answers from students B and C are incorrect?
2. What advice would you give to students B and C to help them avoid factoring this type of problem incorrectly in the future?
3. How can you check that student A factored this expression correctly?
4. What strategy would you use to factor this expression and why did you choose that strategy?

pjr146@psu.edu

Breakout Activity
Handout 4g-MS/HS

1.) $4x - 5 = -29$

2.) $-2x + 7 = -3$

3.) $2x - 1 = -1$

4.) $-1 + 3x = 17$

5.) $3 + 6x = 15$

6.) $-5 - 7x = -5$

7.) $5x + 6 = 46$

8.) $-3x + 4 = -29$

9.) $7x + 4 = 53$

10.) $5x - 4 = 46$

11.) $-5x + 5 = -50$

12.) $-3x + 2 = 5$

13.) $-10 - 7x = 11$

14.) $6x - 8 = 4$

pjr146@psu.edu

Breakout Activity
Handout # 4h

Develop and Map out a 5-10 Plan to Rollout the IWSS Strategy

Day	Where/Who	Activities
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		Test or Checkout on IWS Strategy

pjr146@psu.edu

*S*paced *I*nstructional *R*eview Planning Sheet
(Handout #5)

*S*paced *I*nstructional *R*eview Planning Sheet

Block (Date)	Big Ideas Covered	Problematic Areas	Problematic Areas Targeted for SIR	Date and Instructional Time Allotted (30-40 minutes)
Divide School year into 4-6 week chunks	1. 2. 3. 4. 5. 6. Using Scope & Sequence list out big ideas taught in each chunk	1. 2. 3. 4. Drill down to more specific problem skills and concepts using any available data	1. 2. Select 2 of the identified problem areas. PRIORITIZE	Fast forward 4-6 weeks from when identified skills were taught & list date here to revisit
	1. 2. 3. 4. 5. 6.	1. 2. 3. 4.	1. 2.	

Notes: Use assessment data from Teacher assessments (formal & informal), Progress Monitoring data sources, State Assessments, and other sources of information (teacher's experience). Table abbreviated for space considerations

pjr146@psu.edu

*S*paced *I*nstructional *R*eview Planning Sheet
(Handout #5)

Block (Date)	Big Ideas Covered (or specific skills)	Problematic Areas	Problematic Areas Targeted for SIR	Date and Instructional Time Allotted (10-15 minutes)
	1. 2. 3. 4. 5.	1. 2. 3. 4.	1. 2.	
	1. 2. 3. 4. 5.	1. 2. 3. 4.	1. 2.	
	1. 2. 3. 4. 5.	1. 2. 3. 4.	1. 2.	
	1. 2. 3. 4. 5.	1. 2. 3. 4.	1. 2.	

Notes: Use assessment data from Teacher assessments (formal & informal), Progress Monitoring data sources, State Assessments, and other sources of information (teacher's experience). Table abbreviated for space considerations.

pjr146@psu.edu

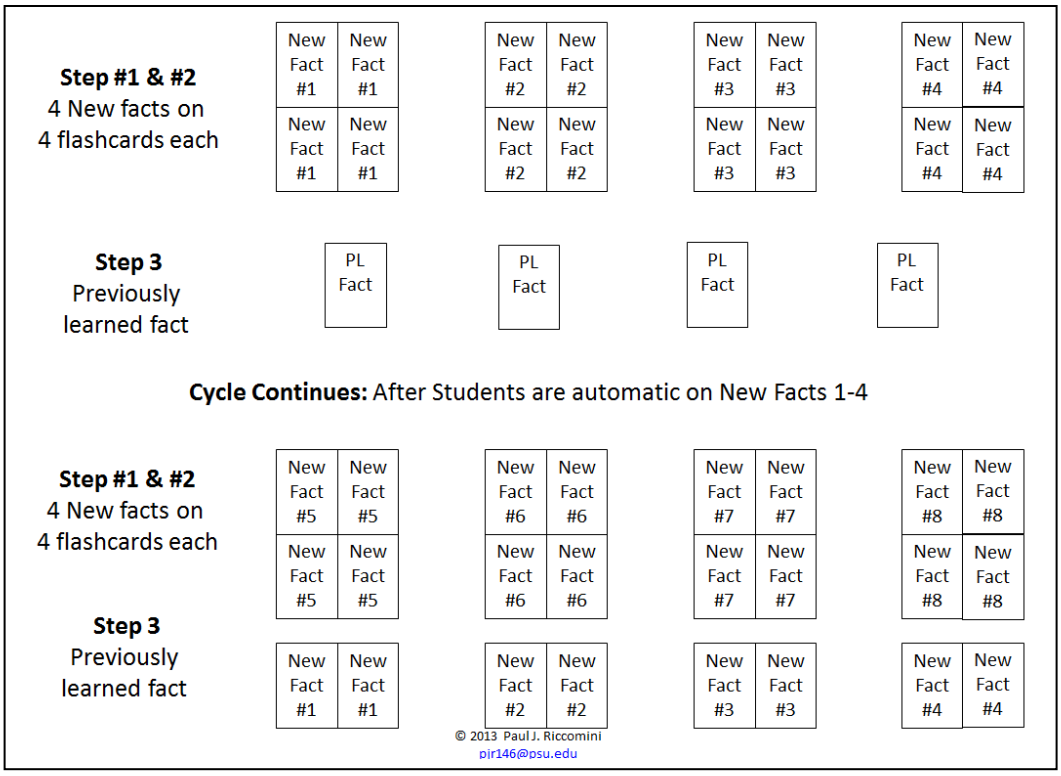
*S*paced *I*nstructional *R*eview Planning Sheet
(Handout #5)

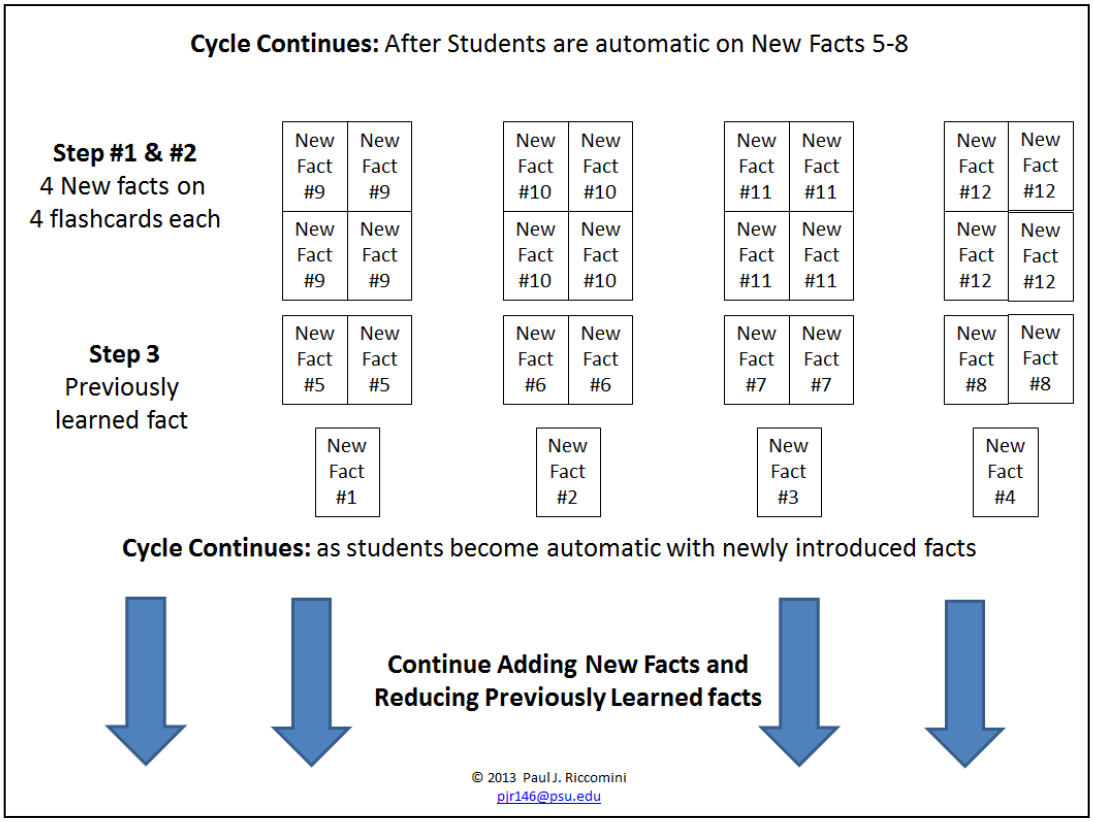
Block (Date)	Big Ideas Covered (or specific skills)	Problematic Areas	Problematic Areas Targeted for SIR	Date and Instructional Time Allotted (10-15 minutes)
	1. 2. 3. 4. 5.	1. 2. 3. 4.	1. 2.	
	1. 2. 3. 4. 5.	1. 2. 3. 4.	1. 2.	
	1. 2. 3. 4. 5.	1. 2. 3. 4.	1. 2.	
	1. 2. 3. 4. 5.	1. 2. 3. 4.	1. 2.	

Notes: Use assessment data from Teacher assessments (formal & informal), Progress Monitoring data sources, State Assessments, and other sources of information (teacher's experience). Table abbreviated for space considerations.

pjr146@psu.edu

Fluency Practice through Chunking
Handout 6





pjr146@psu.edu

Breakout Activity
Handout #7

Fluency practice activity: Math Dash

First Attempt:

(Cover above answers)

Second Attempt

pjr146@psu.edu

Breakout Activity-
Fluency and Automaticity
Handout #7a

Simplify each fraction to lowest terms

$\frac{4}{24} =$	$\frac{25}{35} =$	$\frac{21}{30} =$	$\frac{20}{24} =$
$\frac{9}{24} =$	$\frac{5}{20} =$	$\frac{10}{35} =$	$\frac{4}{14} =$
$\frac{9}{21} =$	$\frac{32}{36} =$	$\frac{15}{35} =$	$\frac{20}{28} =$
$\frac{15}{24} =$	$\frac{55}{60} =$	$\frac{15}{27} =$	$\frac{21}{30} =$
$\frac{20}{28} =$	$\frac{3}{12} =$	$\frac{45}{50} =$	$\frac{4}{10} =$
$\frac{5}{45} =$	$\frac{3}{18} =$	$\frac{2}{10} =$	$\frac{8}{14} =$
$\frac{20}{45} =$	$\frac{4}{28} =$	$\frac{4}{18} =$	$\frac{45}{50} =$
$\frac{12}{27} =$	$\frac{15}{18} =$	$\frac{3}{21} =$	$\frac{2}{6} =$
$\frac{10}{14} =$	$\frac{4}{32} =$	$\frac{3}{27} =$	$\frac{35}{45} =$

pjr146@psu.edu

Breakout Activity
Fluency and Automaticity
Handout #7a

From: www.math-drills.com

Simplify each fraction to lowest terms

$\frac{4}{24} =$	$\frac{25}{35} =$	$\frac{21}{30} =$	$\frac{20}{24} =$
$\frac{9}{24} =$	$\frac{5}{20} =$	$\frac{10}{35} =$	$\frac{4}{14} =$
$\frac{9}{21} =$	$\frac{32}{36} =$	$\frac{15}{35} =$	$\frac{20}{28} =$
$\frac{15}{24} =$	$\frac{55}{60} =$	$\frac{15}{27} =$	$\frac{21}{30} =$
$\frac{20}{28} =$	$\frac{3}{12} =$	$\frac{45}{50} =$	$\frac{4}{10} =$
$\frac{5}{45} =$	$\frac{3}{18} =$	$\frac{2}{10} =$	$\frac{8}{14} =$
$\frac{20}{45} =$	$\frac{4}{28} =$	$\frac{4}{18} =$	$\frac{45}{50} =$
$\frac{12}{27} =$	$\frac{15}{18} =$	$\frac{3}{21} =$	$\frac{2}{6} =$
$\frac{10}{14} =$	$\frac{4}{32} =$	$\frac{3}{27} =$	$\frac{35}{45} =$

pjr146@psu.edu

Breakout Activity
Fluency and Automaticity
Handout 7b

Solve.

(-3)	x	(-9)	=		(-2)	-	(-9)	=
(+1)	+	(+5)	=		(+1)	-	(+5)	=
(-7)	+	(+1)	=		(-4)	÷	(-1)	=
(-6)	-	(+4)	=		(+7)	-	(0)	=
(+8)	-	(+3)	=		(-3)	+	(-9)	=
(+54)	÷	(-9)	=		(-8)	x	(+5)	=
(+14)	÷	(-2)	=		(-6)	÷	(-2)	=
(-8)	-	(+3)	=		(-5)	x	(-7)	=
(+8)	x	(-1)	=		(+4)	+	(-2)	=
(+9)	-	(-6)	=		(0)	÷	(-3)	=
(+9)	-	(0)	=		(-3)	x	(+1)	=
(+6)	÷	(-6)	=		(-8)	-	(+7)	=
(-3)	x	(-1)	=		(-2)	x	(-7)	=
(+27)	÷	(+9)	=		(+18)	÷	(+6)	=

Free Math Worksheets at http://www.math-drills.com

pjr146@psu.edu

Breakout Activity
Fluency and Automaticity
Handout 7b

Solve.

(-3)	x	(-9)	=		(-2)	-	(-9)	=
(+1)	+	(+5)	=		(+1)	-	(+5)	=
(-7)	+	(+1)	=		(-4)	÷	(-1)	=
(-6)	-	(+4)	=		(+7)	-	(0)	=
(+8)	-	(+3)	=		(-3)	+	(-9)	=
(+54)	÷	(-9)	=		(-8)	x	(+5)	=
(+14)	÷	(-2)	=		(-6)	÷	(-2)	=
(-8)	-	(+3)	=		(-5)	x	(-7)	=
(+8)	x	(-1)	=		(+4)	+	(-2)	=
(+9)	-	(-6)	=		(0)	÷	(-3)	=
(+9)	-	(0)	=		(-3)	x	(+1)	=
(+6)	÷	(-6)	=		(-8)	-	(+7)	=
(-3)	x	(-1)	=		(-2)	x	(-7)	=
(+27)	÷	(+9)	=		(+18)	÷	(+6)	=

Free Math Worksheets at http://www.math-drills.com

pjr146@psu.edu

Breakout Activity
Fluency and Automaticity
Handout 7c

$7m + 19 = 124$	$5d - 12 = 13$	$10c + 5 = 35$
$3k - 21 = 33$	$5q - 43 = 22$	$2s - 1 = 11$
$7d - 84 = 14$	$4k - 11 = 13$	$9j + 20 = 110$
$3g - 20 = 22$	$8m - 15 = 17$	$10a + 16 = 136$
$9j - 25 = 101$	$7f + 20 = 132$	$6t - 17 = 7$
$3p + 11 = 23$	$4t - 17 = 3$	$4n + 7 = 35$

pjr146@psu.edu

Breakout Activity
Fluency and Automaticity
Handout 7c

$7m + 19 = 124$	$5d - 12 = 13$	$10c + 5 = 35$
$3k - 21 = 33$	$5q - 43 = 22$	$2s - 1 = 11$
$7d - 84 = 14$	$4k - 11 = 13$	$9j + 20 = 110$
$3g - 20 = 22$	$8m - 15 = 17$	$10a + 16 = 136$
$9j - 25 = 101$	$7f + 20 = 132$	$6t - 17 = 7$
$3p + 11 = 23$	$4t - 17 = 3$	$4n + 7 = 35$

pjr146@psu.edu

Handout #8
Example Task Scaffold

Who or what is involved in the action	
Math vocabulary used	
Paraphrase the question / problem	
Write equation to obtain solution	
Explain equation reasoning	
Explain solution	

pjr146@psu.edu

Breakout Activity
(Handout #9)
Scaffolding Problem Solving:
Focus on the Process rather than Arithmetic

An oak seedling grew 10 inches in the first year. Every year after, it grew 1 inch. After 9 years the oak tree was 18 inches tall.

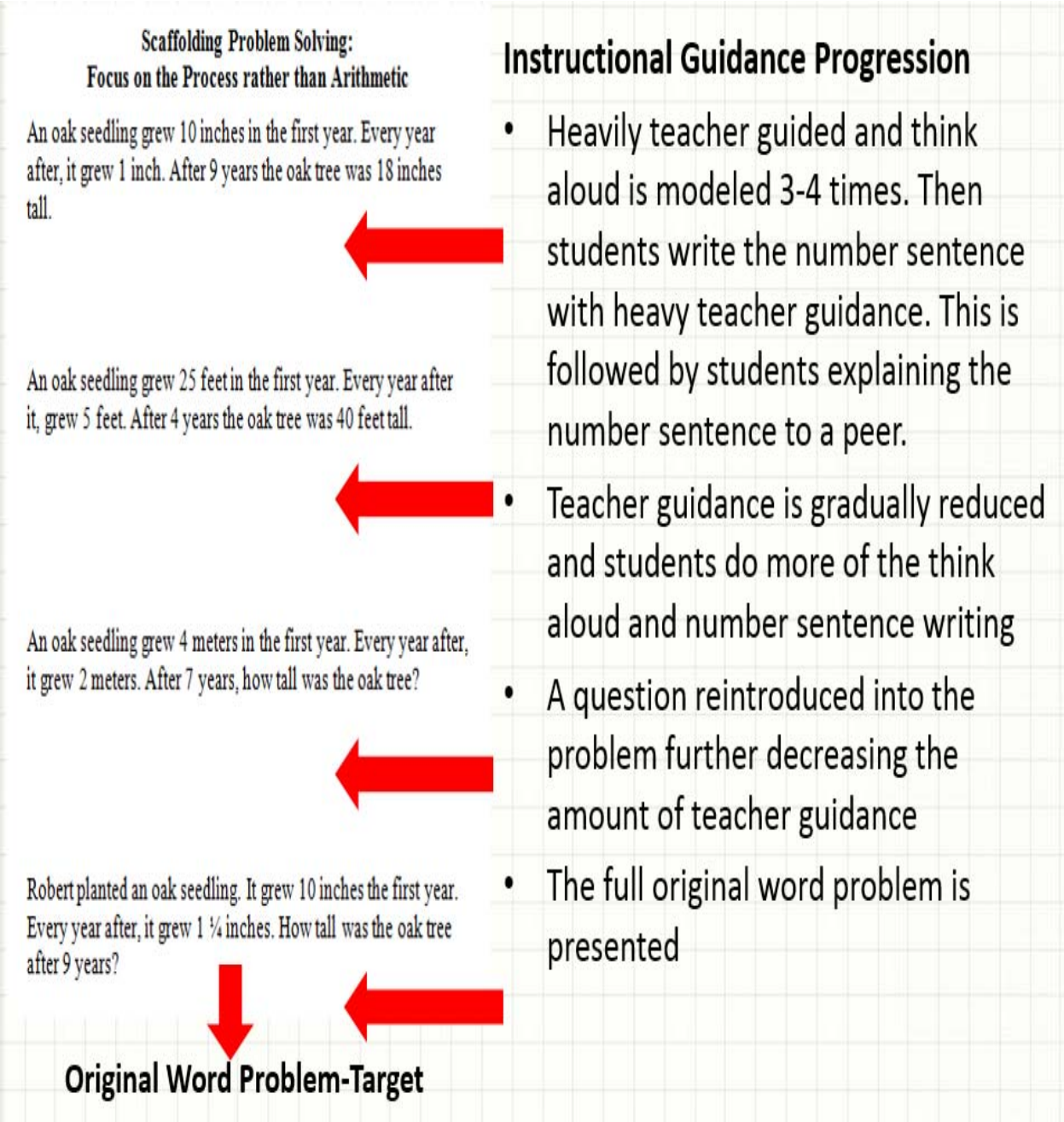
An oak seedling grew 25 feet in the first year. Every year after it, grew 5 feet. After 4 years the oak tree was 40 feet tall.

An oak seedling grew 4 meters in the first year. Every year after, it grew 2 meters. After 7 years, how tall was the oak tree?

Robert planted an oak seedling. It grew 10 inches the first year. Every year after, it grew 1 ¼ inches. How tall was the oak tree after 9 years?

pjr146@psu.edu

Content Scaffolding Progression Outline
Handout #10



pjr146@psu.edu

Instructional Planning Breakout
(Handout #11)
Content Scaffolding Progression

Problem #1
Problem #2:
Problem #3:
Problem #4:

pjr146@psu.edu

Define the Following Math Vocabulary Terms

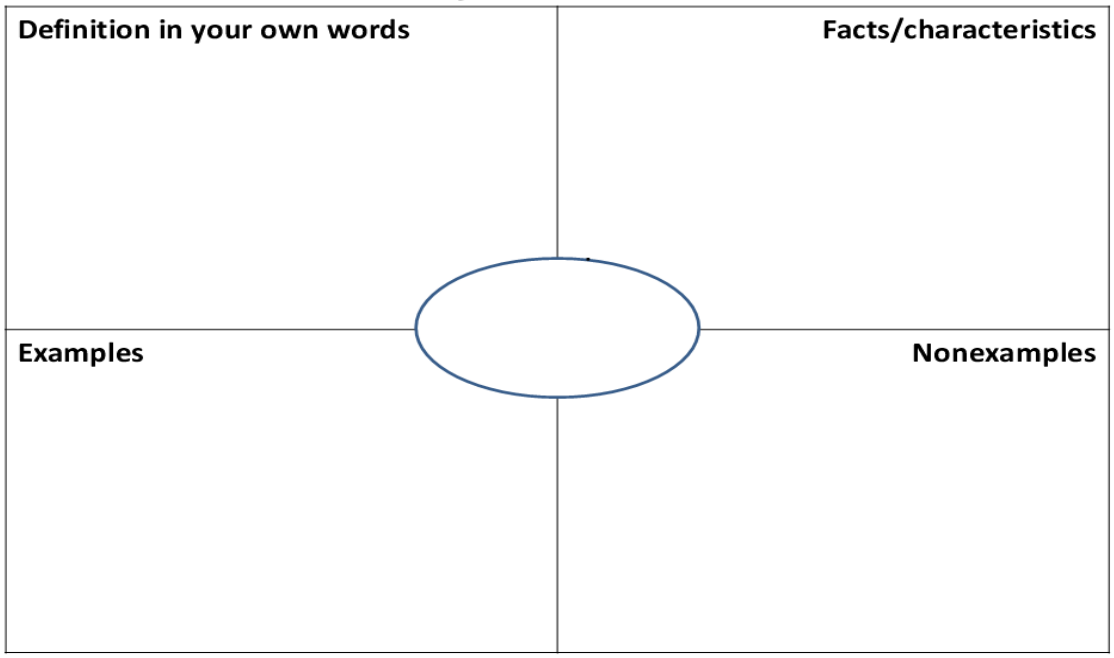
Handout #12

Term	Definition/Meaning	Example
Formula		
Integer		
Quadrant		
Rational Number		
Simplest Form		
Equation		
Variable		

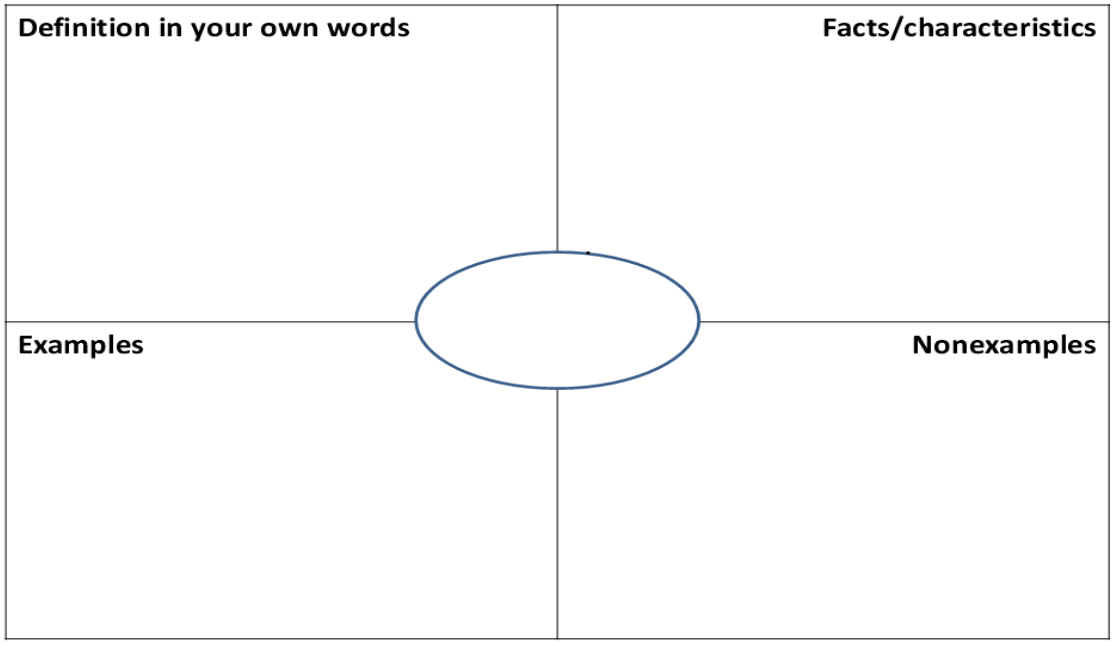
pjr146@psu.edu

Handout #13

Frayer Model



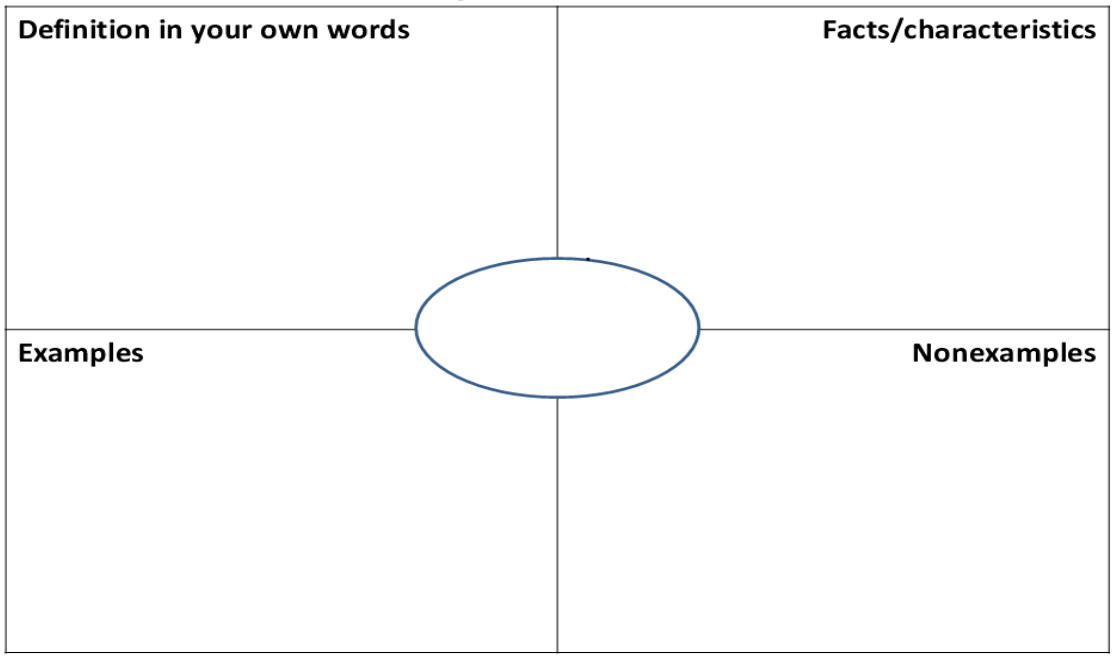
Frayer Model



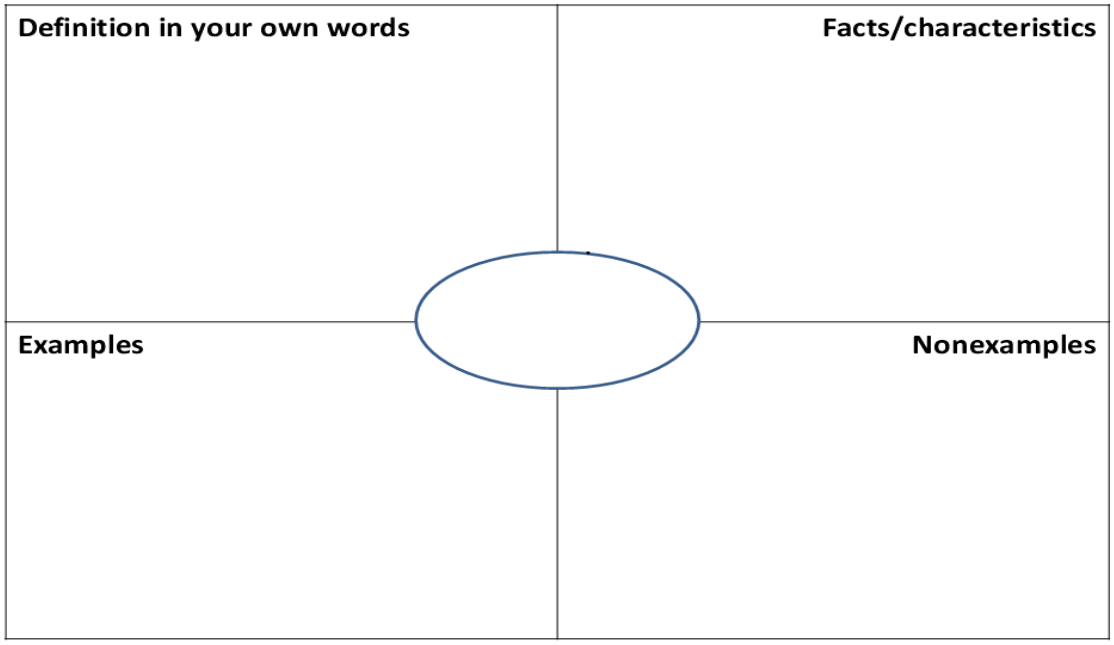
pjr146@psu.edu

Handout #13

Frayer Model



Frayer Model



pjr146@psu.edu

Peer Tutoring Practice Example Using Frayer Model
(Handout #14)

The following is an example of using peer tutoring to practice remembering important math vocabulary learned through a Frayer

Tutor: *The purpose of this lesson is to remember and understand the important math vocabulary terms that we have been learning over the past week during math class. (Tutor stats the learning objective.) You will practice telling me what a term means when I show it to you and then give me 1-2 important facts or characteristics about the term, and then provide me an example and non-example. If you get stuck I will help you.*

Tutor is looking at the Frayer Model of Acute Angle (The tutee cannot see the Frayer Model):

See Next Page

Tutor: *Remember the term we've been studying- acute angle. Tell me what it means.*
Tutee: *An angle between 0 and 90 degrees. It is small*

Tutor: *Good! An acute angle is an angle that measures between 0 and 90 degrees. Now, tell me one more time what an acute angle means.*
Tutor: *Excellent. Now, can you tell me a fact or characteristics about an acute angle?*
Tutee: *small angle.*(If partner cannot answer…ask him to think about the definition)

Tutor: *Great! Anything else?* (If not move to next question)
Tutor: *Now I want you to give me an example of an acute angle. You can either draw it with your pencil or point to an example in the room. What is your example?*
Tutee: *I will draw my example for you.*

Tutor: *That is correct! The example you drew me looks like an acute angle because it is between 0 and 90 degrees.*
Tutor: *Now I want you to give me a non-example of an acute angle. You can either draw it with your pencil or point to a non-example in the room. What is your non-example?*
Tutee: provide a non-example or identify a non-example

Tutor: *That is correct! The non-example you drew me doesn't look like an acute angle because it is bigger than 90 degrees.*
Tutor: *Great Work! An acute angle is an angle that measures between 0 and 90 degrees.* (Go onto to next word or switch roles).

pjr146@psu.edu

Acute Angel Frayer Model:

Frayer Model

Definition in your own words

The measure of an angle with a measure between 0° and 90°

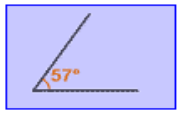
Facts/characteristics

smaller and pointed angles

Alligator mouth open just a little

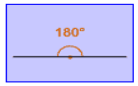
Acute Angle

Examples

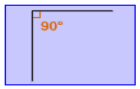


Acute angle
Less than 90°

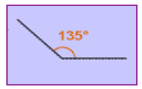
Nonexamples



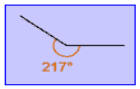
Straight angle
Exactly 180°



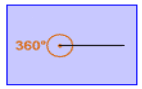
Right angle
Exactly 90°



Obtuse angle
Between 90° and 180°



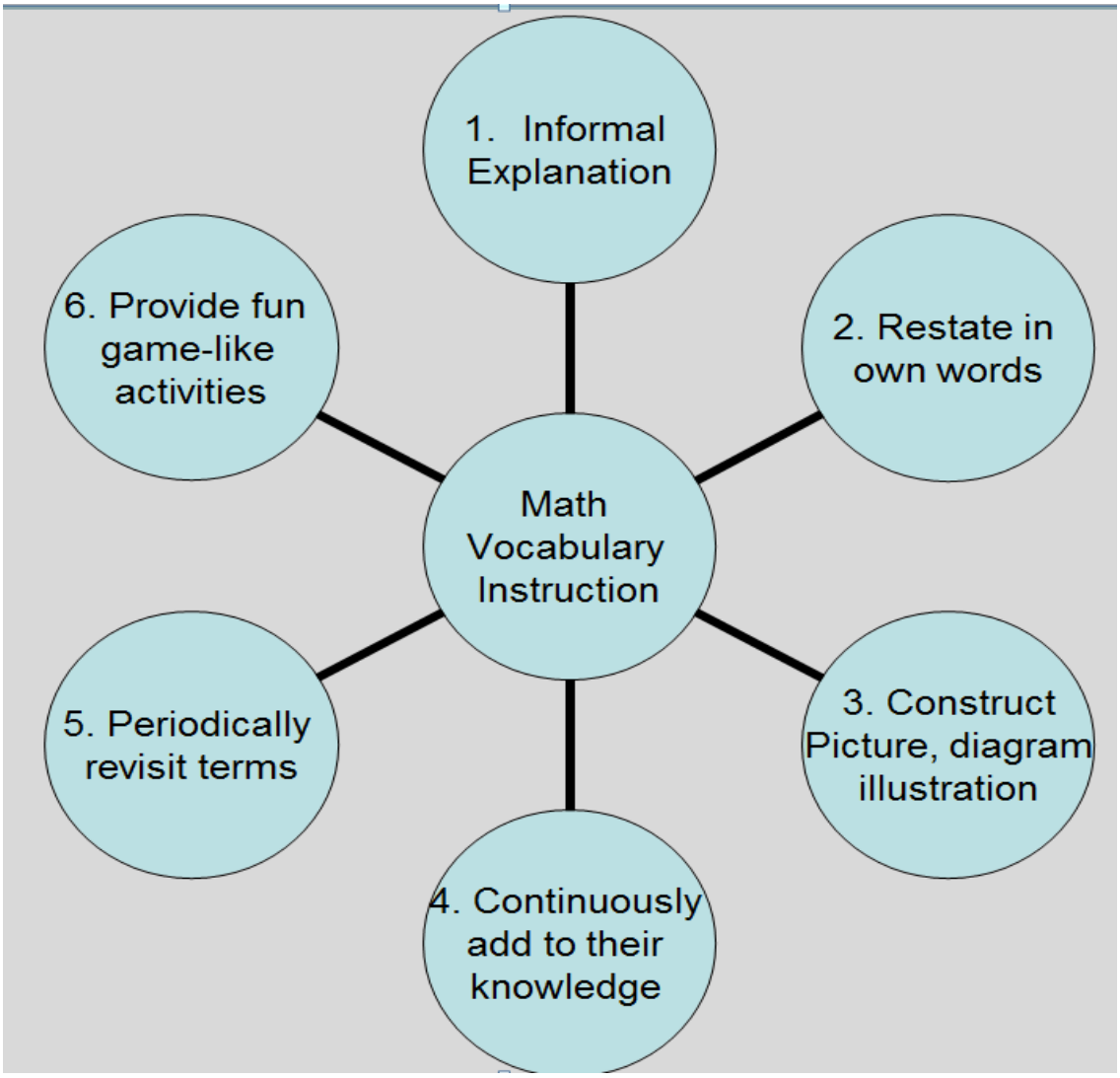
Reflex angle
Between 180° and 360°



Full angle
Exactly 360°

pjr146@psu.edu

Graphic Organizer Vocabulary
Handout #15



pjr146@psu.edu

Handout #16

Vocabulary Instruction Considerations

1. How are you teaching math vocabulary?
2. How are you facilitating the learning and remembering of math vocabulary?
3. Does each teacher have an established list of essential vocabulary for the year or per unit?
4. Are you testing math vocabulary regularly?
5. Are you practicing using math vocabulary throughout the course of the year?
6. Is there any preteaching of vocabulary occurring? Where? When? Who? How?

pjr146@psu.edu

Additional Information and Resources

Ellis, E. S., Worthington, L., & Larkin, M. J. (1994). *Executive summary of research synthesis on effective teaching principles and the design of quality tools for educators* (Technical Report No. 6, University of Oregon, National Center to Improve the Tools of Educators). Retrieved July 17, 2004, from http://idea.uoregon.edu/~ncite/documents/techrep/other.html

Pashler, H., Bain, P., Bottge, B., Graesser, A., Koedinger, K., McDaniel, M., and Metcalfe, J. (2007) *Organizing Instruction and Study to Improve Student Learning* (NCER 2007-2004). Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ncer.ed.gov.

Riccomini, P. J. & Witzel, B. S. (2010). *Response to intervention in math.* Thousands Oaks, CA: Corwin Press.

Riccomini, P. J. & Witzel, B. S. (2010). *Computation of integers: Mathematics interventions for middle and high school students.* Upper Saddle River, NJ: Pearson Education Inc.

Stein, M., Kinder, D., Silbert, J., & Carnine, D. W. (2006). *Designing effective mathematics instruction: A direct instruction approach* (4th ed.). Ohio: Pearson-Merrill Prentice Hall.

Witzel, B., & Riccomini, P. J. (2009). *Computation of fractions: Math interventions for elementary and middle grades students.* Upper Saddle River, NJ: Pearson Education Inc.

Witzel, B., & Riccomini, P. J. (2011). *Solving equations: An algebra intervention*. Upper Saddle River, NJ: Pearson Education Inc.

Witzel, B., Riccomini, P. J., & Herlong, M. (2013). *Building number sense through the Common Core.* Thousands Oaks, CA: Corwin Press.

Otter Creek Institute. ***Mastering Math Fact Families*** is a structured, day-by-day way for your kids to learn their math facts, one family at a time. Designed as an alternative method for teaching our popular ***Mastering Math Facts Program***, the fact families approach introduces math facts and their inverses in a complete, ready-to-use supplemental program. Created for individual classroom use, this program includes all blackline masters and answer keys for all grade levels. (www.oci-sems.com/bookstore/prod_masteringmathfactfamilies_orderform.asp)

Note:
Parts of this presentation were taken from:

U.S. Department of Education. (2008). *Foundations for Success: The Final Report of the National Mathematics Advisory Report.* Washington, DC: Retrieved from http://www.ed.gov/MathPanel.

pjr146@psu.edu