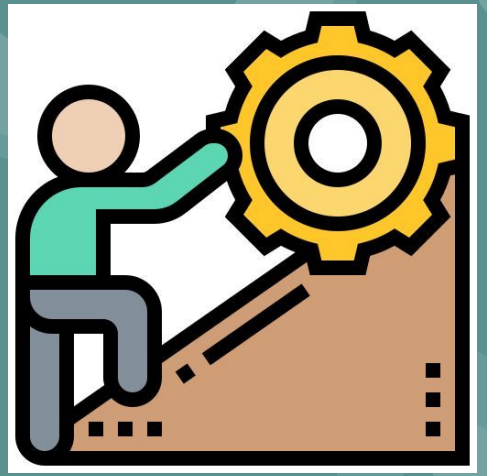
Tools for Thoughtful Assessment: Explaining Solutions

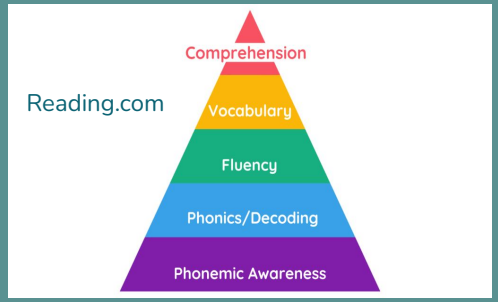
Sarah Thorpe
6th Grade Math Teacher/Deeper Learning Couch
Lee County Middle High School

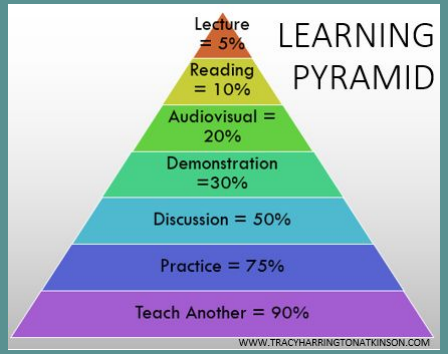
Challenges in the Classroom

- Foundational skills to build on
- Understanding math vocabulary
- Writing and verbalizing accurate descriptions
- Using vocabulary to explain reasoning



Why these challenges?

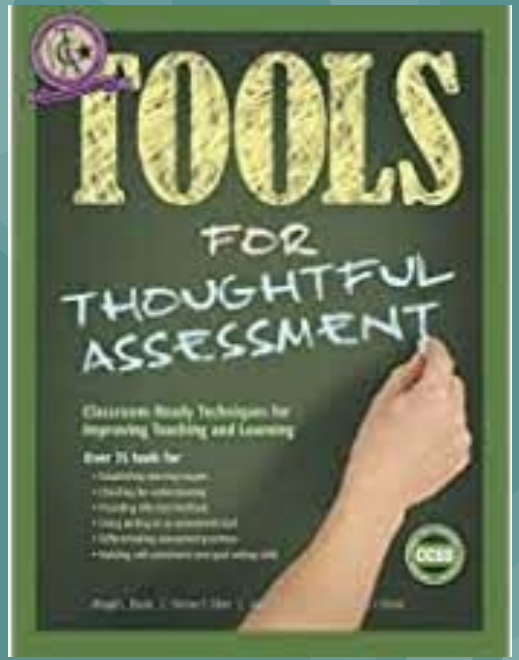




- Gaps between developmental writing skills and application of knowledge
- Critical thinking deficits
- Strong teaching strategies
- Structural family support missing
- Unidentified learning disabilities

Addressing Challenges

- *Explaining Solutions*, Tools for Thoughtful Assessment, pg. 90



Strengths of the Tool

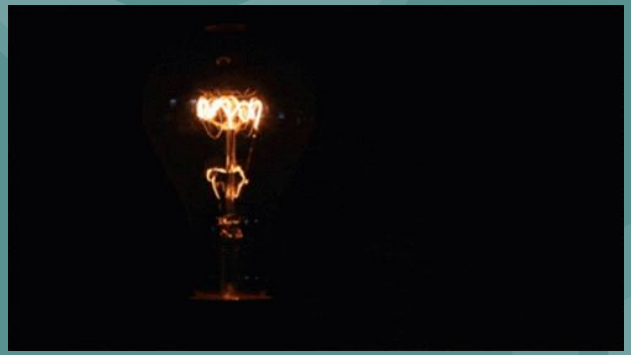
- Enhances proficiency of vocabulary
- Broadens vocabulary cache
- Utilizes critical thinking skills
- Develops writing skills and handwriting
- Solving and explaining word problems in Math
- Increases focus and retention
- Boosts confidence
- Identifies deficits
- Allows for reflection of understanding
- Provides room for feedback
- Increased performance
- Bridges gaps between writing and application across subjects

Research in Action

I will use the Explaining Solutions tool to increase the amount of math terminology and the accuracy of solution in descriptive reasoning processes

Goals for Utilizing Explaining Solutions

- Increased use of Mathematical vocabulary when explaining reasoning
- Accurate descriptions and use of words
- Development of fundamental writing skills
- Deeper understanding of subject
- Applicable critical thinking skills
- Accurate solutions



Implementation of Tool

- When:
  - Utilize strategy in the first two weeks of February
- Frequency:
  - Every day for 2 weeks

- Students will solve a word problem and explain their reasoning using as many accurate Mathematical vocabulary words as possible and correct sentence structure

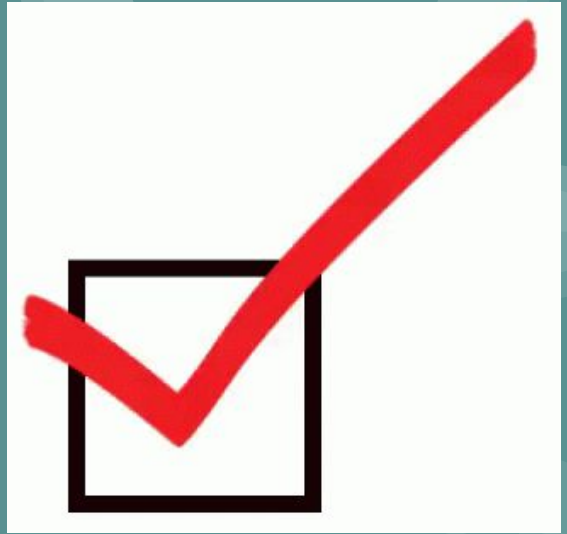
- Record data by tallying number of vocabulary words used in explanation when used accurately to describe their solution or understanding

- Discuss anonymous examples with class for feedback

- Privately read through explanations daily for next steps and assessment

Assessment of Tool

- ❑ Observe measurable data
- ❑ Graph measurable data
- ❑ Share measurable data with co-workers and deeper learning coaches
- ❑ Reflect on problem areas, improvements, and successes
- ❑ Implement changes



Style of Questioning

	"Explain your reasoning" Questions
2/5/2024	Tariq drew a tape diagram to help figure out the weight of each fox. Explain how the tape diagram is like the equations.
2/6/2024	Add objects to both sides of this hanger to make an equation. Explain how the equation is like the hanger.
2/7/2024	Here is a new equation: `x+2.01=3.5`. Describe how you could figure out what value of `x` makes this equation true.
2/8/2024	Examine the table. Describe how to determine the cost of any number of pounds of apples.
2/9/2024	Here is a new equation: `12+y=20`. Describe a situation that could represent this equation.
2/12/2024	Write two things you know about `(1/2)^3.
2/13/2024	Amir says that (x+3)^2 and x^2+3^2 are equivalent. Help him understand why they are not equivalent.
2/14/2024	Here is Jayden's table and Rebecca's graph. Show or explain how you know these represent the same relationship.
2/15/2024	Nathan determined that the equation `d=60t` represents this situation. Explain how the parts of his equation relate to the situation.
2/20/2024	Here is a problem and its solution. 4(3)^2. Explain how you go from the problem to the solution.

Student Response Examples from Experimental Group

	Student Examples
2/5/2024	Student G, 2/05/2024 - "Your doing the same process and the x represents the unknown number like the equation."
2/9/2024	Student N, 2/9/2024 - "The blocks split in half when you go from (1/2)^2 to (1/2)^3. Also, the blocks double every time."
2/12/2024	Student D, 2/12/2024 - "There are two reasons these 2 equations are not equivalent . One reason they are not equivalent is the first equation is in parenthesis and the first one only has one number to a power and the second one is not it parentheses and both of the numbers have a power ."
2/14/2024	Student B, 2/14/2024 - "Every time the side length goes up by one the Area of purple rectangles, p goes up by 4."
2/20/2024	Student P 2/20/2024 - "You would use PEMDAS but since the parentheses are solved you do 3 to the power of 2 which is 9 then multiply it by 4."

Results of Data

Control Group	This graph displays the tally of appropriate uses of mathematical terminology in a given 'explain your reasoning' question for the day.										
5th/6th Period	2/5	2/6	2/7	2/8	2/9	2/12	2/13	2/14	2/15	2/20	2 Week Tally Total
Thorpe	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Tue	
2A	1	1	0	2	0	0	1	0	1	1	7
2B	1	0	1	1	2	1	2	1	0	1	10
2C	1	1	0	1	1	3	2	2	2	2	15
2D	0	0	1	1	0	1	2	2	0	1	8
2E	1	0	1	2	0	1	2	1	2	1	11
2F	1	0	1	0	1	1	1	1	1	0	7
2G	0	0	1	1	1	0	0	0	0	0	3
2H	0	1	1	1	0	1	1	2	2	1	10
2I	1	2	0	1	2	3	2	1	2	2	16
2J	0	1	0	0	0	0	0	0	1	1	3
2K	0	0	0	0	0	0	0	0	0	0	0
2L	0	0	0	0	0	0	0	0	0	0	0
2M	1	0	0	0	0	0	0	0	0	0	1
2N	0	1	2	1	1	1	2	1	1	2	12
2O	0	1	0	1	1	0	1	1	0	0	5
2P	2	1	1	2	0	0	0	1	2	1	10
Total terms used per day	9	9	9	14	9	12	16	13	14	13	118

Experimental Group	This graph displays the tally of appropriate uses of mathematical terminology in a given 'explain your reasoning' question for the day.										
1st/2nd Period	2/5	2/6	2/7	2/8	2/9	2/12	2/13	/14/202	2/15	2/16	2 Week Tally Total
Thorpe	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri	
B	2	1	2	2	1	3	4	3	4	3	25
C	2	0	1	1	2	2	3	2	3	3	19
D	2	1	1	2	2	4	3	3	4	4	26
E	0	1	1	2	3	2	2	2	2	3	18
F	0	0	1	2	2	1	2	2	4	3	17
G	2	2	1	2	3	3	2	4	3	4	26
H	1	0	1	2	1	2	2	2	2	2	15
I	1	0	1	2	3	2	3	0	4	3	19
J	0	0	1	2	3	3	2	3	4	5	23
K	0	1	1	2	0	1	1	0	0	1	7
L	1	0	1	1	1	2	2	0	2	2	12
M	2	1	1	1	2	2	2	1	4	4	20
N	1	1	2	1	3	3	3	2	4	3	23
O	1	0	1	1	2	4	2	2	3	3	19
P	1	2	1	3	3	2	2	4	3	4	25
Total terms used per day	16	10	17	26	32	32	36	31	49	48	301

Interpreting the Results...

- Students who took a vested interest increased their use of accurate math terminology to explain their reasoning by **up to 5 terms per response**
- Implementation of this tool is **vital** for engaging and applying knowledge
- This tool works in conjunction with **Bloom's Taxonomy** and increases skill level and proficiency of critical thinking ability in students
- **Explaining Solutions tool works!**