The Jabberwocky of Learning Mathematics

… or literacy factors that have a bearing on creativity

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Jabberwocky

‘Twas brillig and the slithy toves
Did gyre and gimble in the wabe:
All mimsy were the borogoves,
And the mome raths outgrabe

…

By Lewis Carroll [Prof (maths) Charles Dodson Cambridge University]

Proficiencies, Literacy and Creativity

	Number & Algebra	Geometry & Measurement	Statistics and Probability
Understanding			
Fluency			
Problem Solving			
Reasoning			

Creativity

- Mathematics is about Problem Solving and Problem Solving is a creative Process
- https://nrich.maths.org/5784

15 Counters

- Four students have 15 counters between them. All students have a different number of counters. How many counters might each student have?

- Sharing Counters task, p. 12 of Sullivan, P. (2018). Challenging Mathematical Tasks: unlocking the potential of all students. Melbourne: Oxford University Press

Time to be Creative

- P P P B
- Versus
- I R E

- https://www.youtube.com/watch?v=TMBsTw37eaE

Which leads to problem Solving (Creativity)?

- Pose
- Pause
- Pounce
- Bounce
- Initiate
- Response
- Evaluation

Literacy and Mathematics

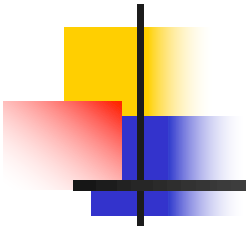
- Teachers speak 89% of class time (80%).
- Classroom Discussion
  - Effect Size 0.82
- Vocabulary Programs
  - Effect Size 0.67
- Self-verbalisation
  - Effect Size 0.64
- Teaching for Problem Solving
  - Effect Size 0.61

Hattie et al (2017). Visible Learning for Mathematics

TIMSS video study

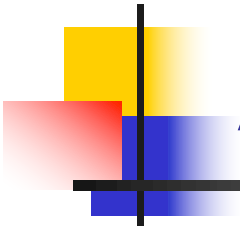
- Teachers talked more than students, both in terms of the number of words and the length of utterances. The ratio of teacher to student words was at least 8:1. Most teacher utterances were at least 5 words long while most student utterances consisted of fewer than 5 words

Hollingsworth, Lokan & McCrae, ACER, p. xv



Implication

- Was it all Jabberwocky to the children?



Alice

"It seems very pretty," she said when she had finished it, "but it's rather hard to understand!"

(You see she didn't like to confess even to herself, that she couldn't make it out at all.)

"Somehow it seems to fill my head with ideas--only I don't exactly know what they are! However, somebody killed something: that's clear, at any rate…"

Humpty

- Humpty goes on to meticulously explain each part of the poem.

Creativity?

- Less Teacher Talk

Catch 22

	Number & Algebra	Geometry & Measurement	Statistics and Probability
Understanding			
Fluency			
Problem Solving			
Reasoning			

Vocabulary

- Vocabulary knowledge begets comprehension (and vice versa)

- Students need 90-95% automatic word recognition to provide *necessary context* to allow for comprehension to occur

Hirsh, D. and P. Nation. 1992. What vocabulary size is needed to read unsimplified texts for pleasure? *Reading in a Foreign Language* 8, 2: 689-696.

Word Problems

- “70% of errors made by students on standard word problems could be attributed to lack of comprehension” (Clements, 2004)
- However
  - “There is significant research evidence that reveals that recognising words in isolation does not necessarily mean they will be recognised as quickly in connected text.” (Ehri, 1997)

Vocabulary

Worth Paying Attention To?

Marzano (2004) found that teaching *academic* vocabulary could positively influence standardized test scores by as much as 33%.

Cited in Kovarik, M (2010) Building Mathematics Vocabulary, *International Journal for Mathematics Teaching and Learning*.

Marzano Six Steps to Effective Vocabulary Instruction

1. Provide a ‘friendly’ definition and explanation from teacher
2. Student uses the word
3. Create pictures, representations, graphics
   Thinkboard, Frayer Board
4. Multiple exposures required
5. Revisit and consolidate
6. Define

Definitions: Help or Hindrance

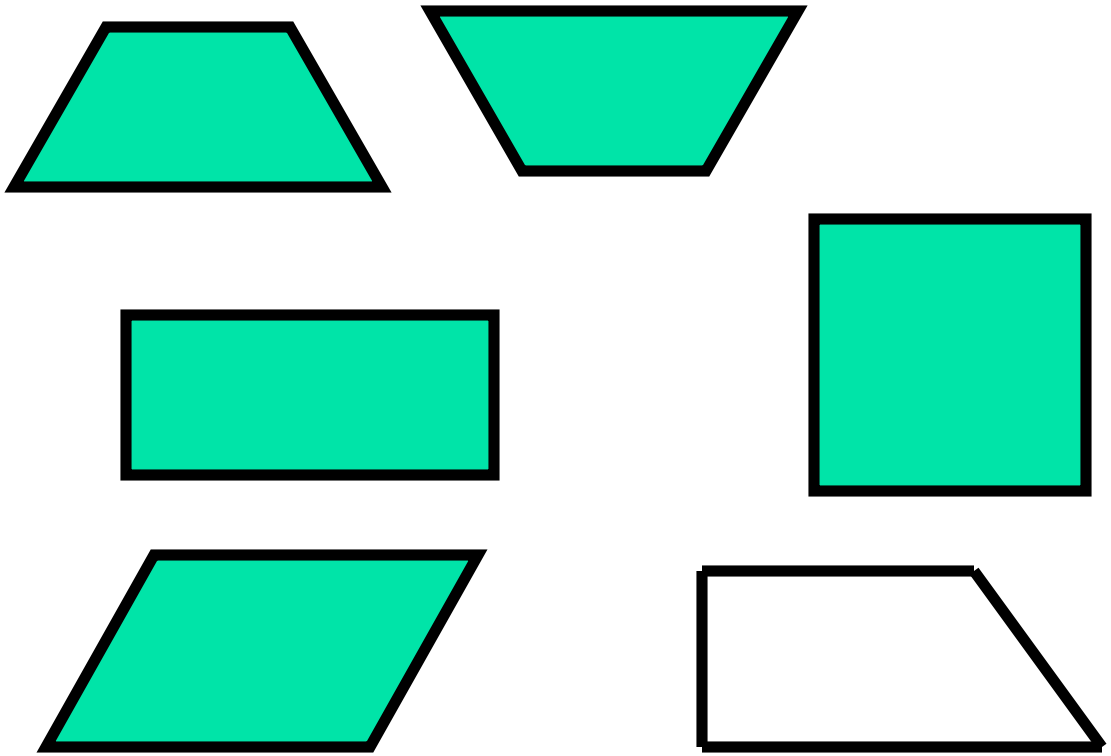
Read

Annulus

Explain

Define

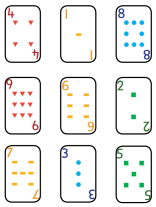
Definition of a trapezium



Menu

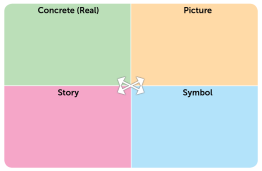
Mathematics Vocabulary Routines Menu

1. Card Bingo



see page 33 of
"Mathematics Games with School Friendly Cards"

2. Thinkboard
(Graphic Organiser)



download this organiser at:
http://www.drpaulswan.com.au/word-problems

3. Barrier Games
(Oral Language/Written Instructions)

download 2 pages on Barrier Games at:
www.drpaulswan.com.au/mathematics-literacies

4. Mystery Bag
(Oral Language/Written Instructions)

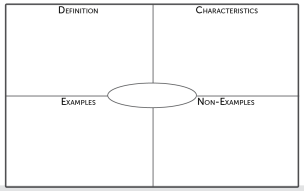
download a fact sheet on the Mystery Bag at:
www.drpaulswan.com.au/mathematics-literacies

5. Children's Literature

e.g:
"The Greedy Triangle"
by Marilyn Burns

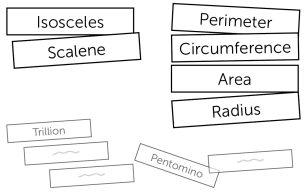
download the 6-page list of Children's Literature at:
www.drpaulswan.com.au/mathematics-literacies

6. Frayer Board (Four Square)
(Graphic Organiser)



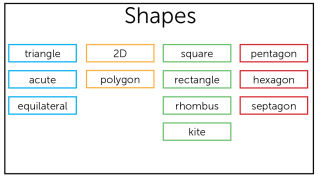
http://www.drpaulswan.com.au/word-problems

7. Word Sort



download an example of this at:
www.drpaulswan.com.au/mathematics-literacies

8. Word Wall

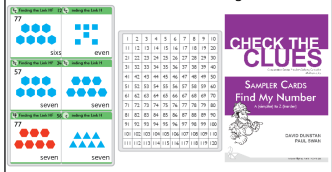


www.drpaulswan.com.au/mathematics-literacies

9. Which one doesn't belong?
Talking in Mathematics

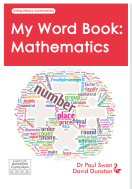
Website: http://wodb.ca/
https://www.youtube.com/watch?v=ACsc1LVyJks

10. Check the Clues
(Links Vocabulary, Comprehension and Problem Solving)



download Clues Number Board Set / Sampler Cards:
www.drpaulswan.com.au/mathematics-literacies

11. My Word Book Activities



Activities on pages 43 - 48 of
My Word Book: Mathematics

Free Downloadable Year 3
Flash Cards for words that have
appeared in NAPLAN since 2010

http://www.drpaulswan.com.au/book-extras

12. Other activities
(Definition or matching)

State Six: (At the start of a lesson state six words that will be used during the lesson)
Newspaper/Magazine Search
Vocabulary Games
- Prefixes / Suffixes
- Root Words
- Bingo
- Taboo
- Pictionary

Dice (e.g Lolly Bowl)

a number of related downloads at:
www.drpaulswan.com.au/mathematics-literacies

Reasoninng Requires Literacy

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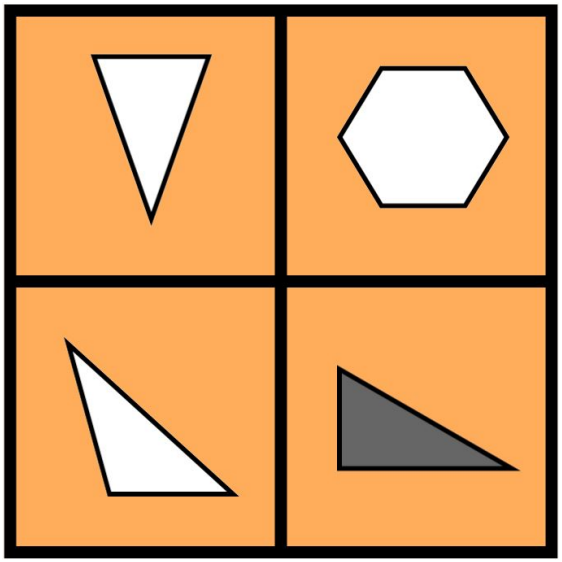
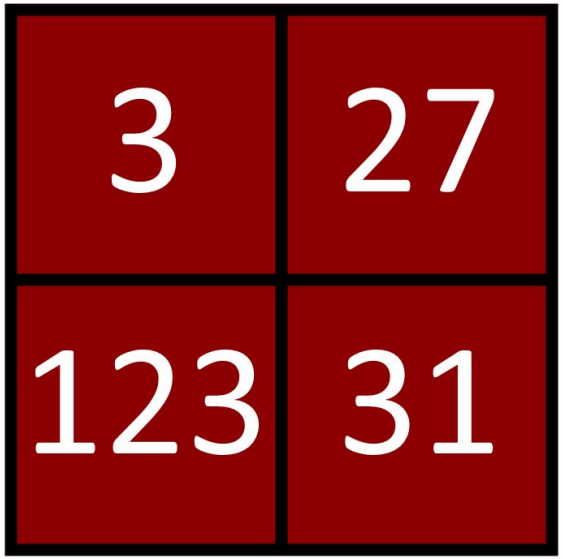
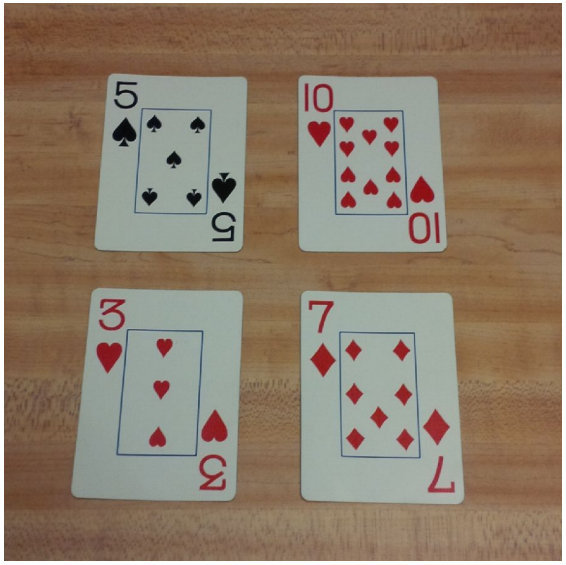
Which One Doesn't Belong?

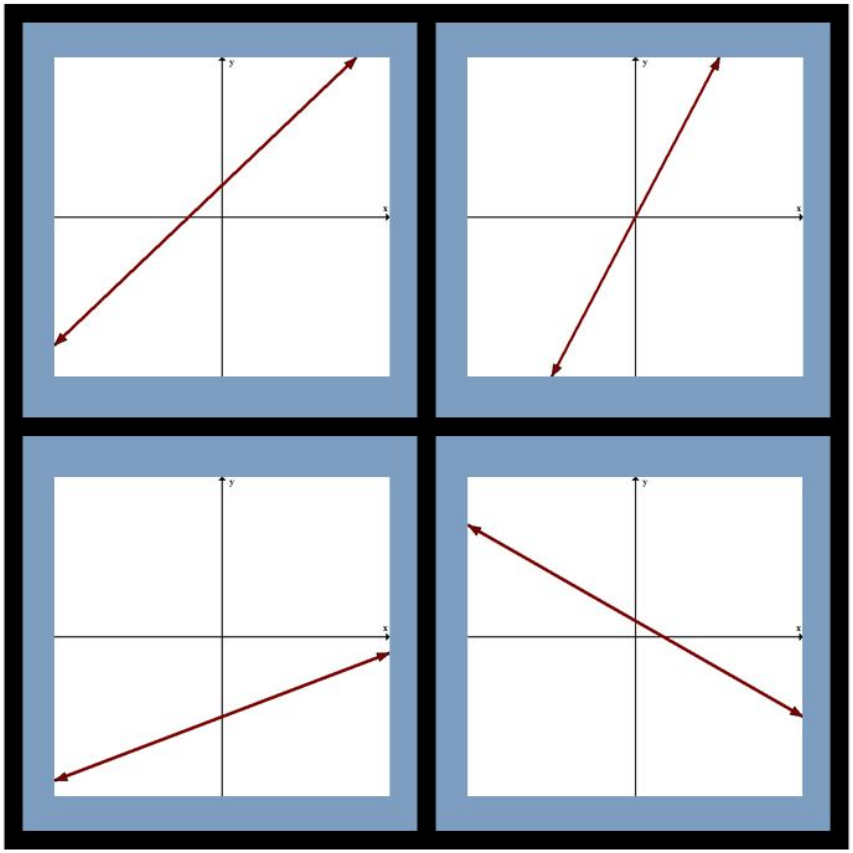




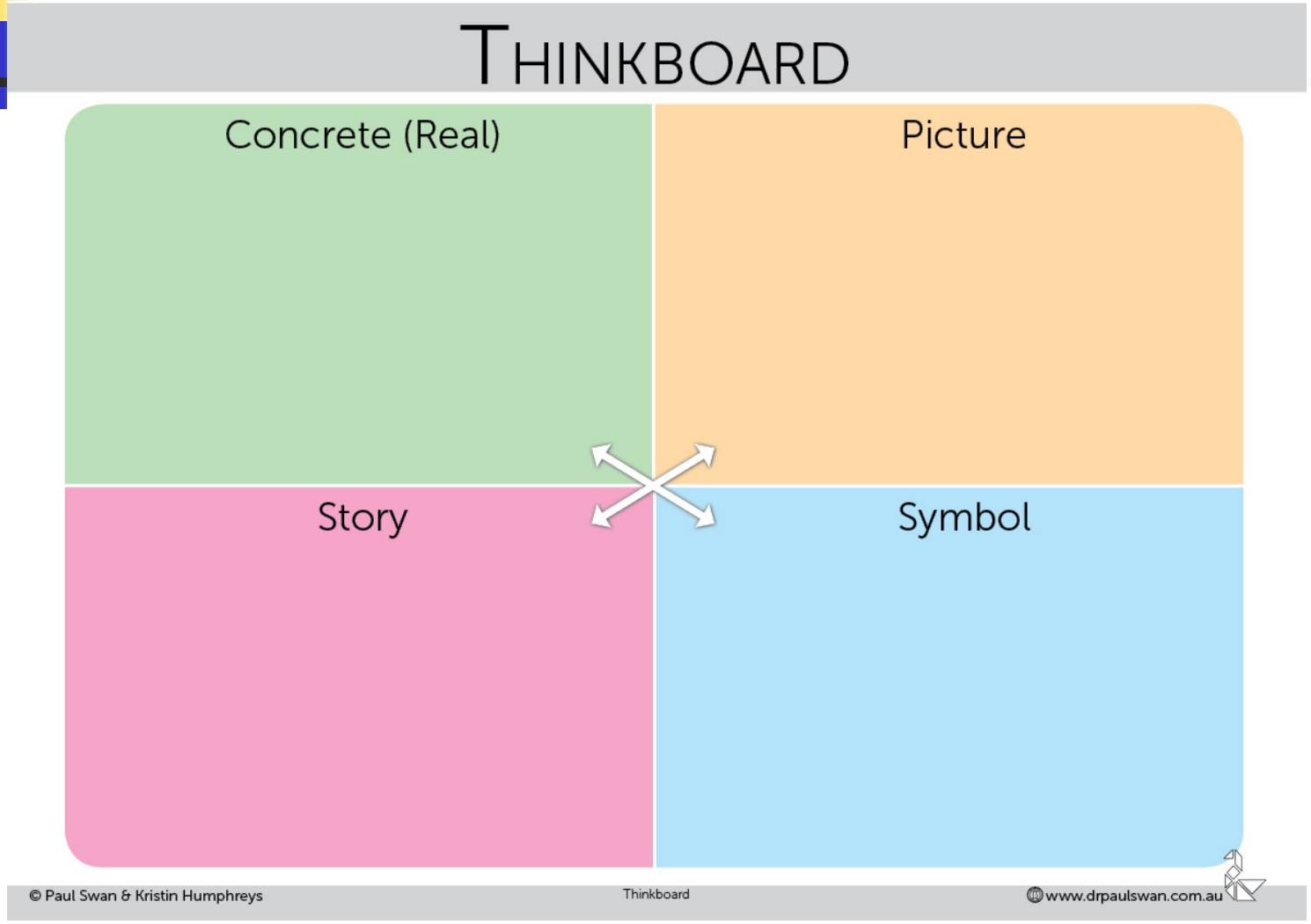


Christopher Danielson
https://www.stenhouse.com/content/which-one-doesnt-belong

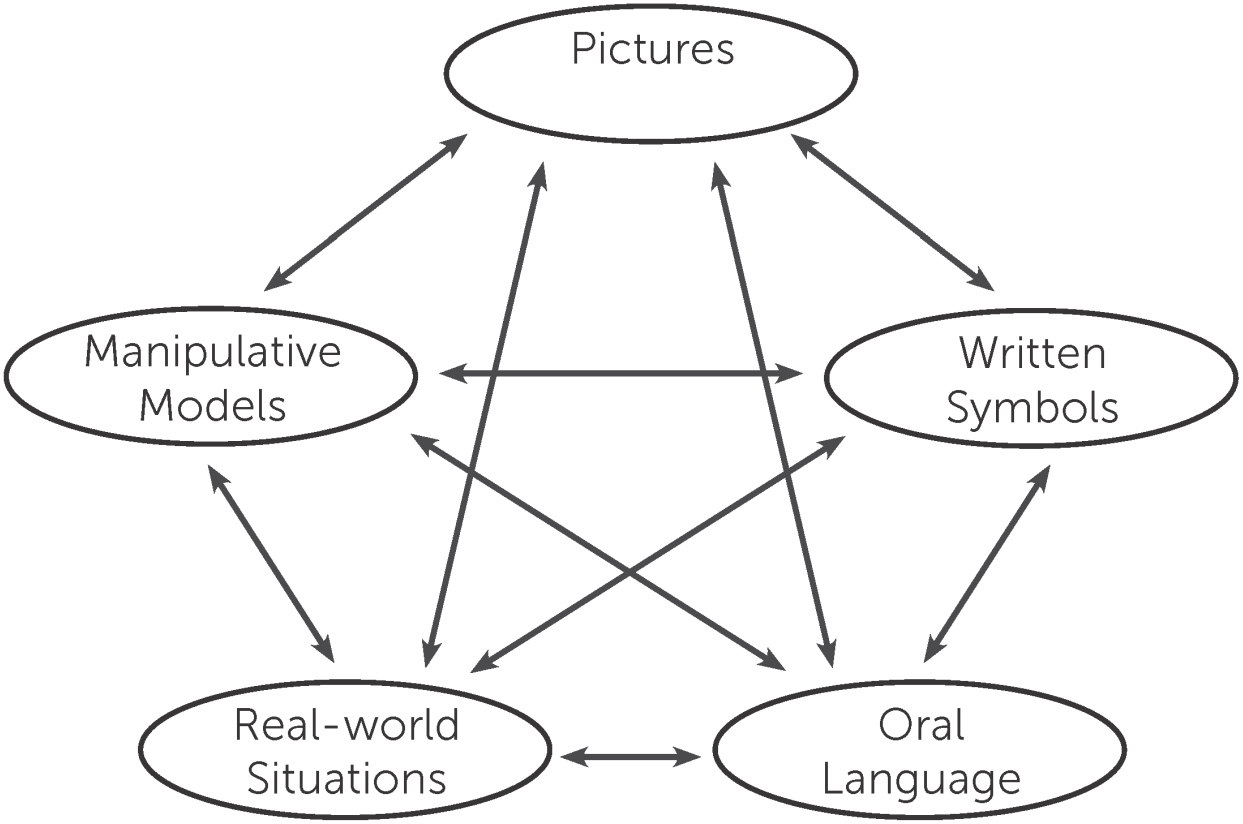
Which One Doesn't Belong?



Thinkboard

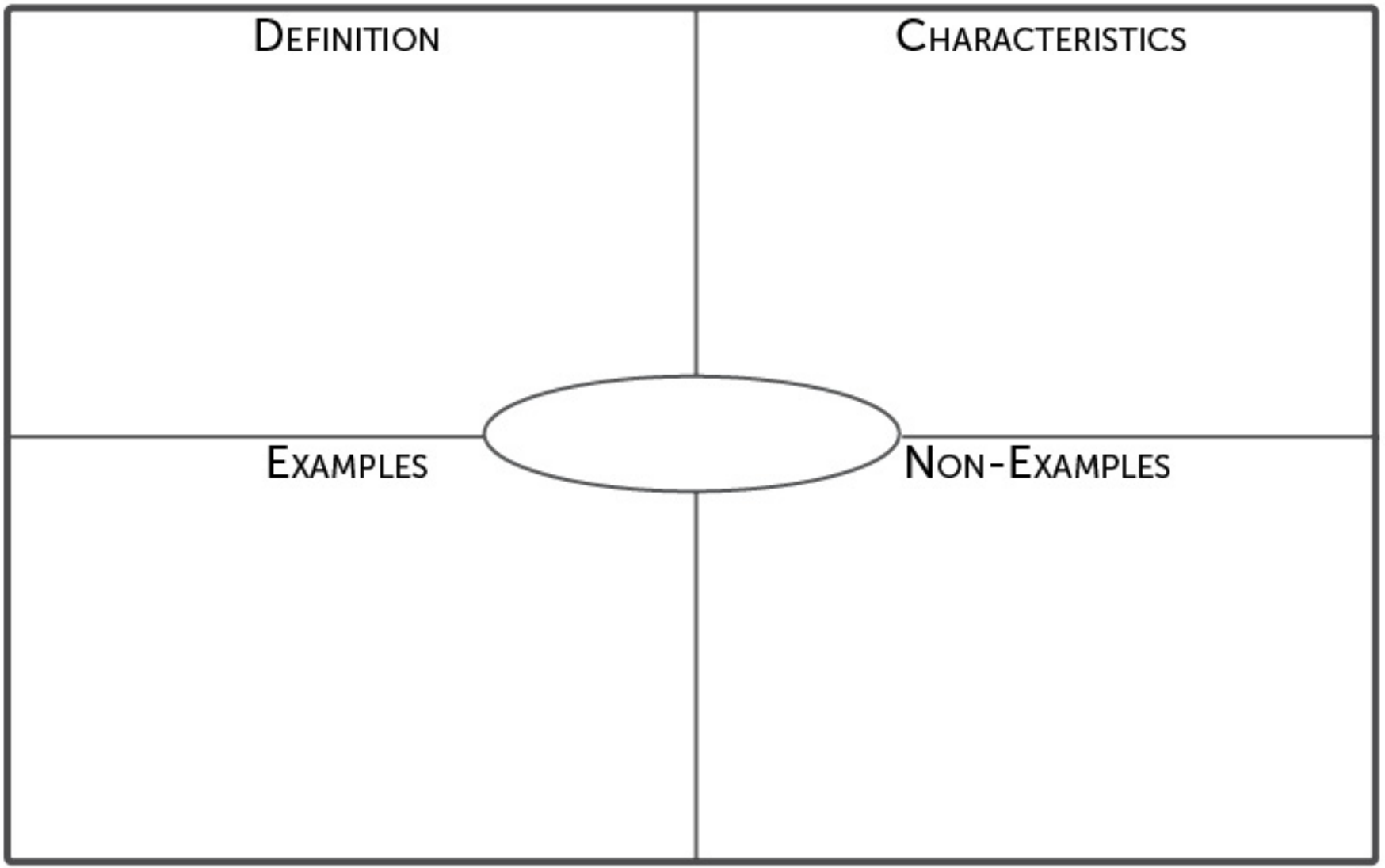

THINKBOARD
Concrete (Real)
Picture
Story
Symbol
© Paul Swan & Kristin Humphreys
Thinkboard
www.drpaulswan.com.au

Making the Links



Lesh, Post & Behr, 1987

Frayer Board



Why NOT nine? Reasoning

	Scalene	Isosceles	Equivalent
Acute			
Right			
Obtuse			

Jabberwocky

- The word *jabberwocky* itself is sometimes used to refer to nonsense language
- A few words that Carroll invented in this poem (namely "chortled", "galumphing", and "vorpal") have entered the language..