Using Podcasts to Examine Elementary Pre-service Teachers' Mathematics Knowledge for Teaching

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AMTE

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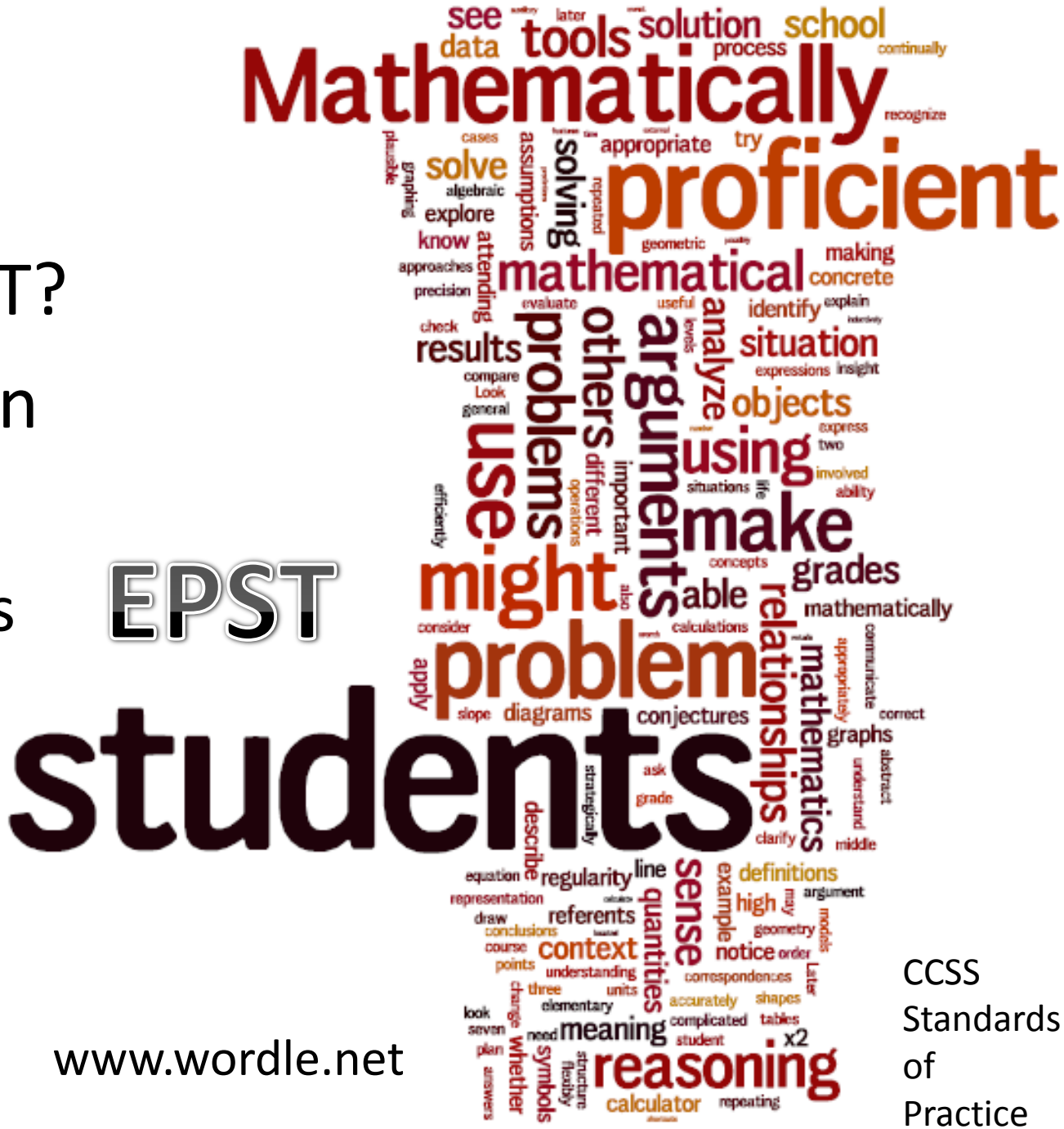
Overview

- What is MKT?
- Study Design
  - Methods
  - Procedures
  - Tasks
- Results
- Next Steps

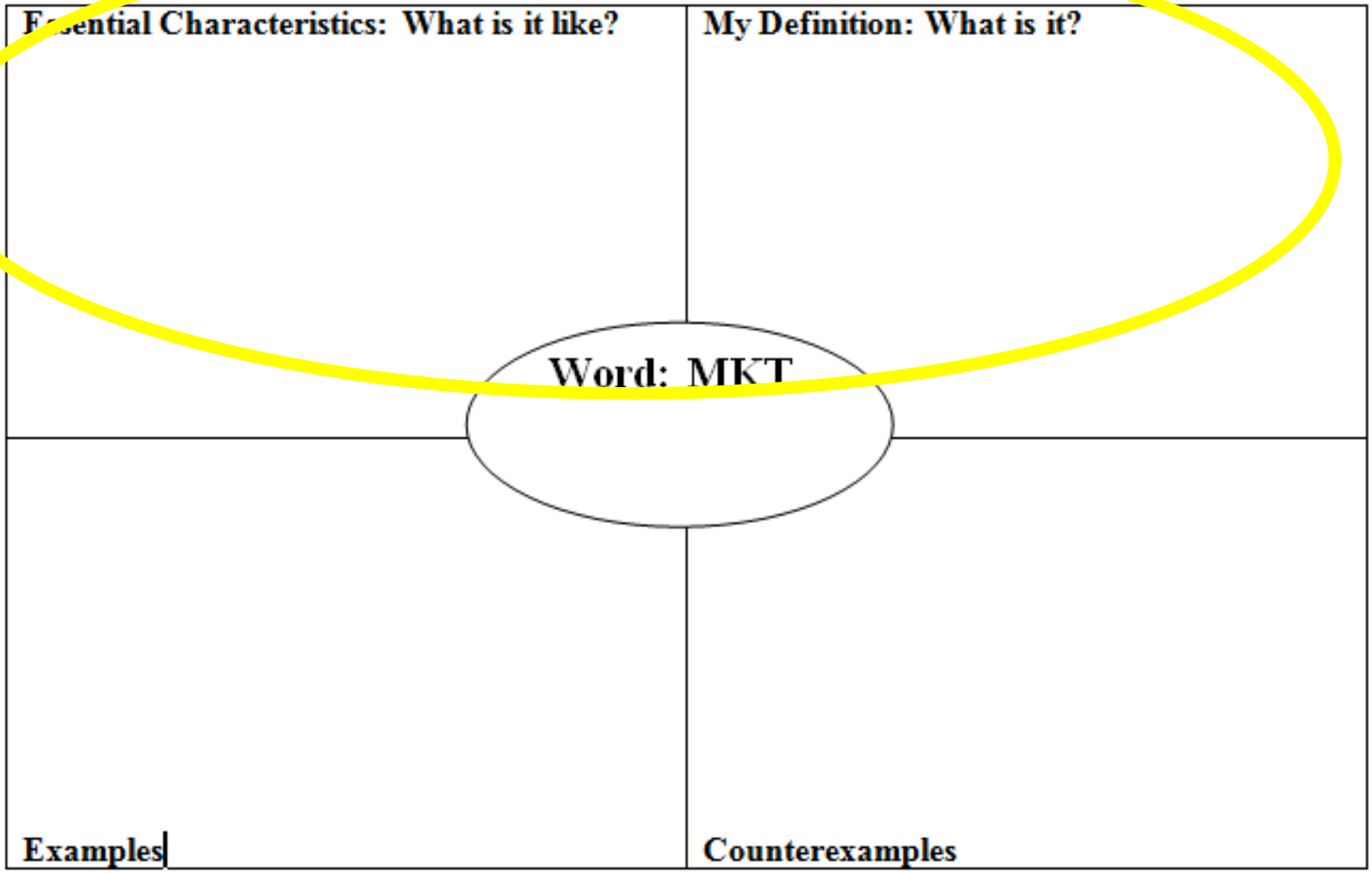
EPST



www.wordle.net

CCSS Standards of Practice

FRAYER MODEL



What is MKT?

Examples

Shulman (1986) – PCK

Ma (1999) – Profound Understanding

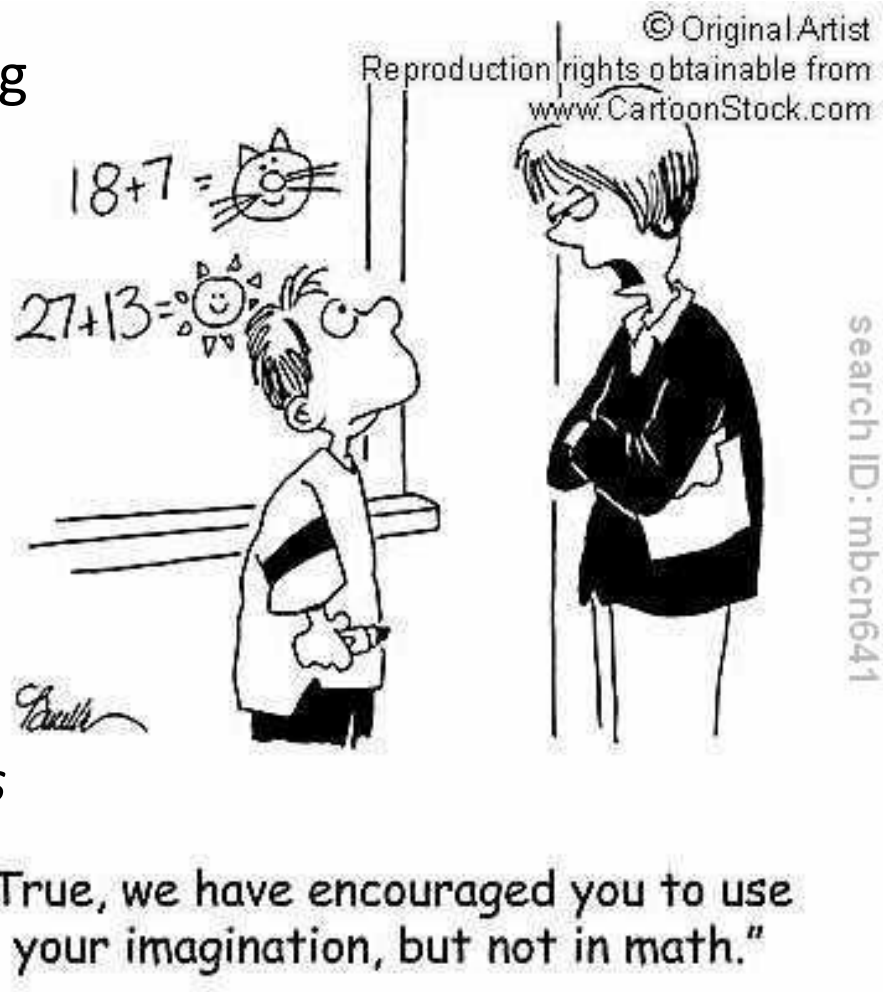
NRC (2001) – Proficient Teaching

Ball (2010) – Usable Knowledge

Teachers with more mathematical knowledge for teaching are more likely to:

1. *supply mathematical explanations,*
2. *use concrete models of mathematical processes*
3. *connect multiple representations*
4. *translate between students' everyday language and mathematical language.*

Counterexample



Research Design

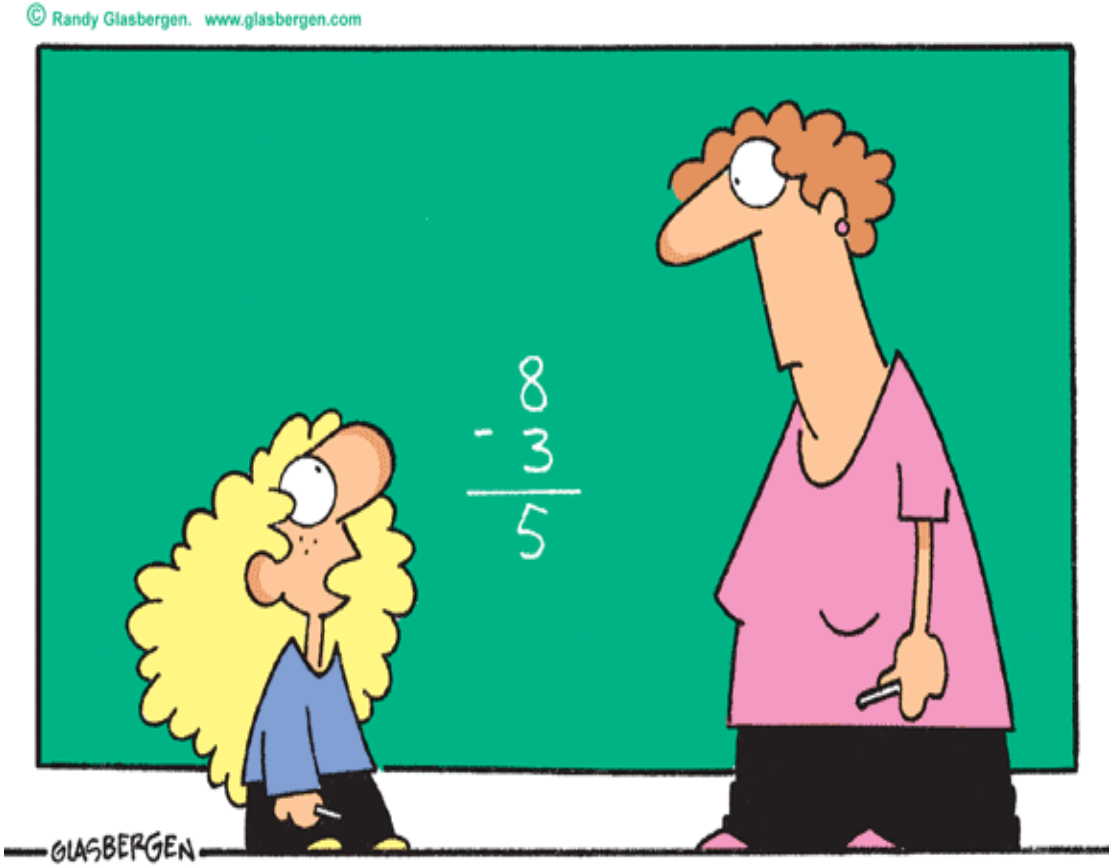
Purpose: This grounded theory study was designed to gather descriptive and qualitative data on the nature of elementary teacher candidates' mathematical content knowledge for teaching at various points in their education.

Course	Number of Pre-Service Elementary Teachers	Data Collection
MTH 125 Mathematics for Elementary Teachers I	n = 33	Random selection of section (1 of 3) Pre-podcast (September) Post-podcast (December)
EDS 422 Teaching Elementary Mathematics	n = 50	Three sections Post-podcast (December)

Subtraction with Regrouping

Present the following problem as though you were explaining it to a student.

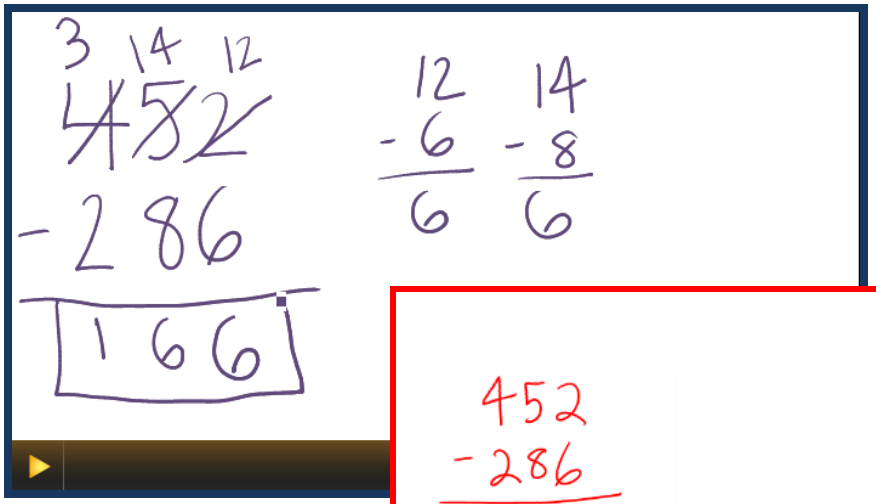
$$\begin{array}{r} 452 \\ -286 \\ \hline \end{array}$$

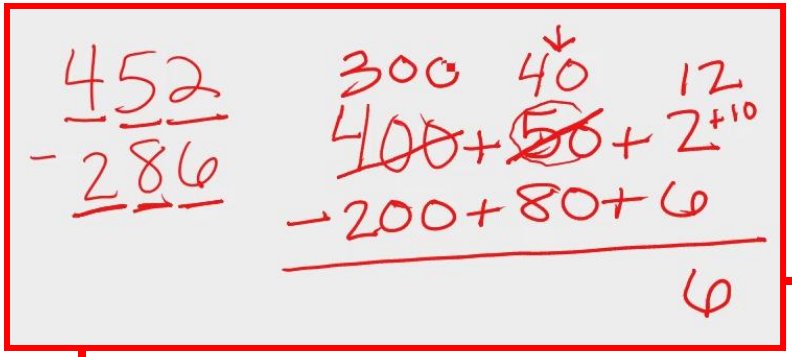


"What gives anyone the right to take 3 away from 8? Why should 8 be diminished to the lesser value of 5 just to satisfy someone's obsession with math?"

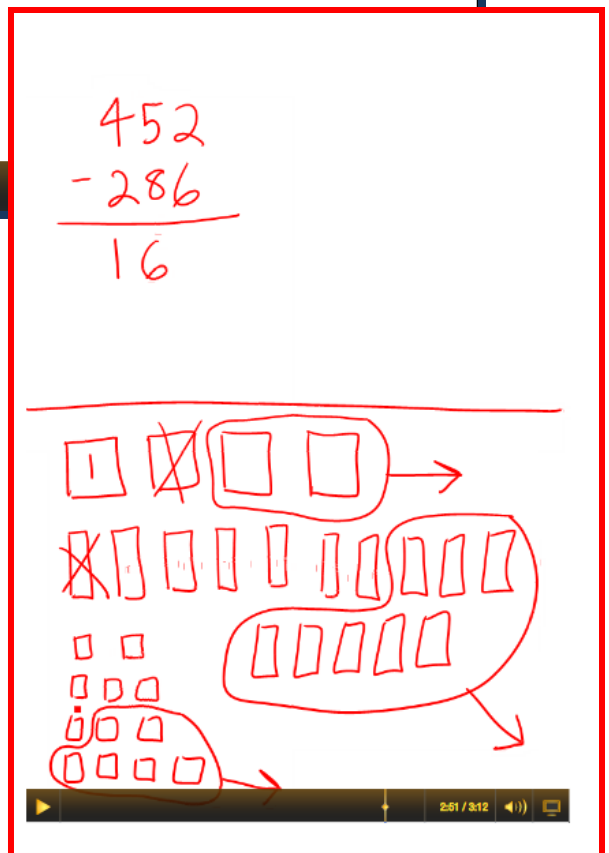
Rubric Development:
A Grounded Theory Approach

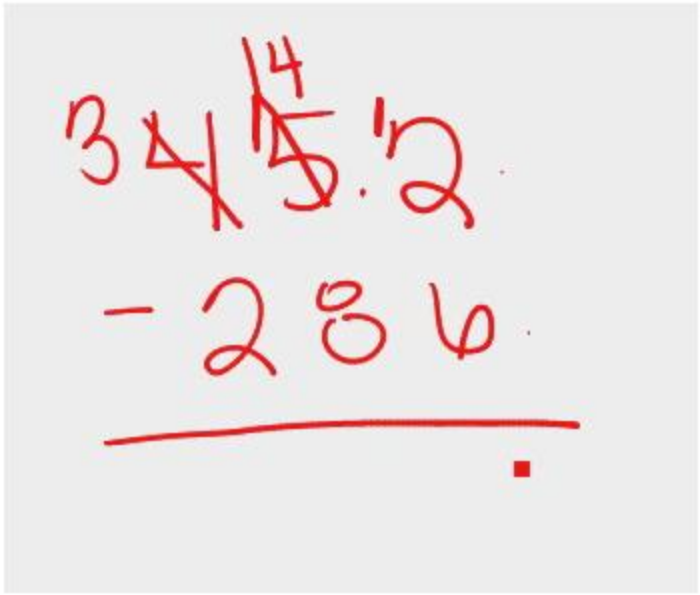
EDS 422



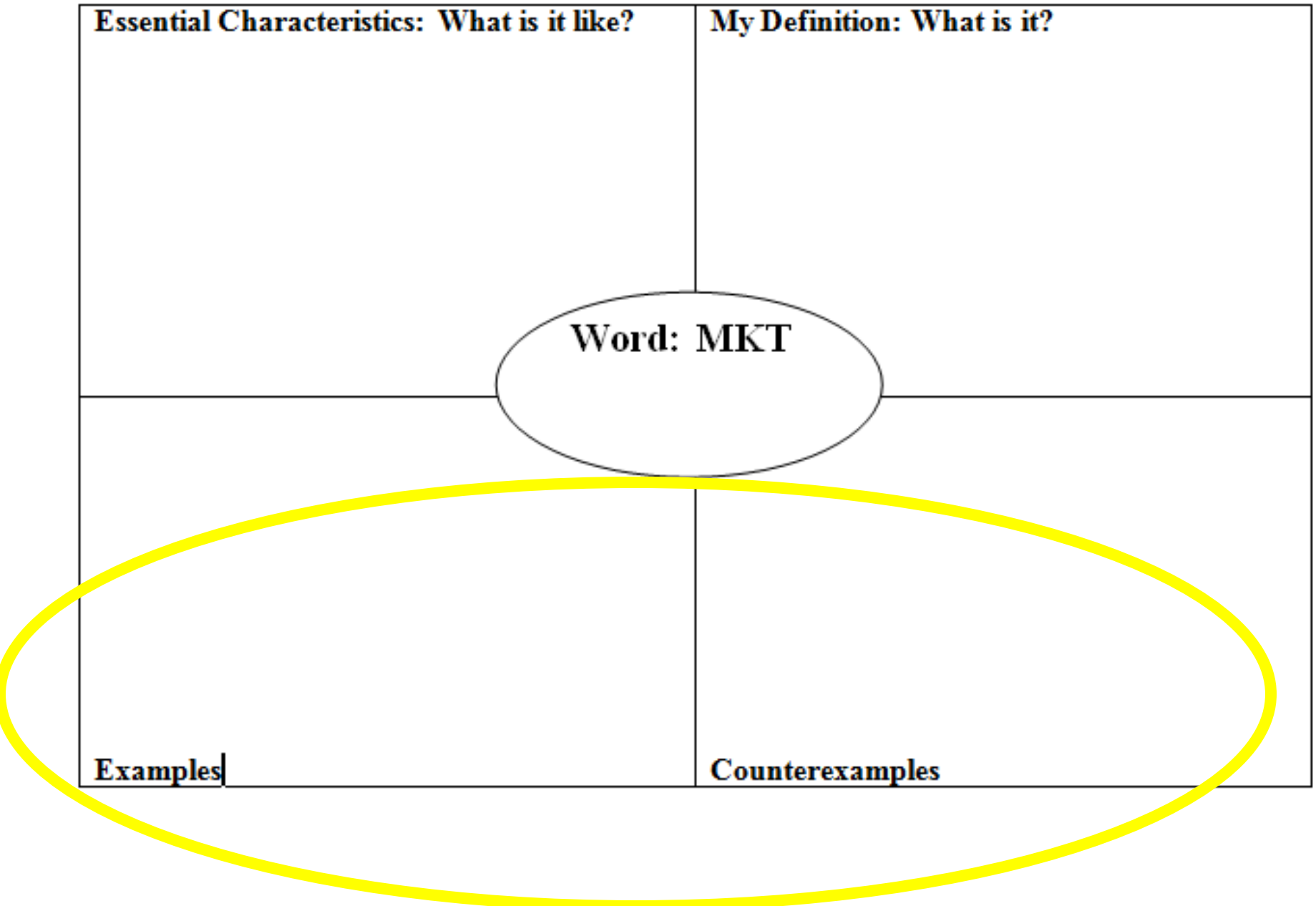


MTH 125
Pre- and
Post-
Podcasts





FRAYER MODEL

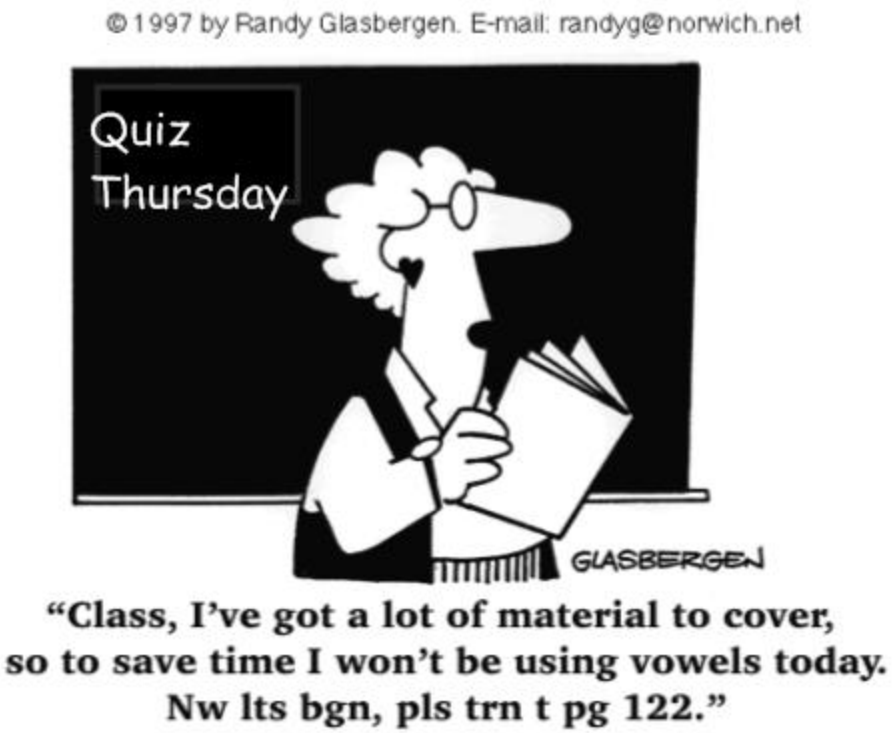


Podcasting MKT

What did we see in the MKT examples

- Calculate correctly
- Provide students with explanations of common concepts and procedures
- Use pictures and diagrams to represent concepts and procedures

Counterexample



Podcasting 101

Jing http://www.jingproject.com/

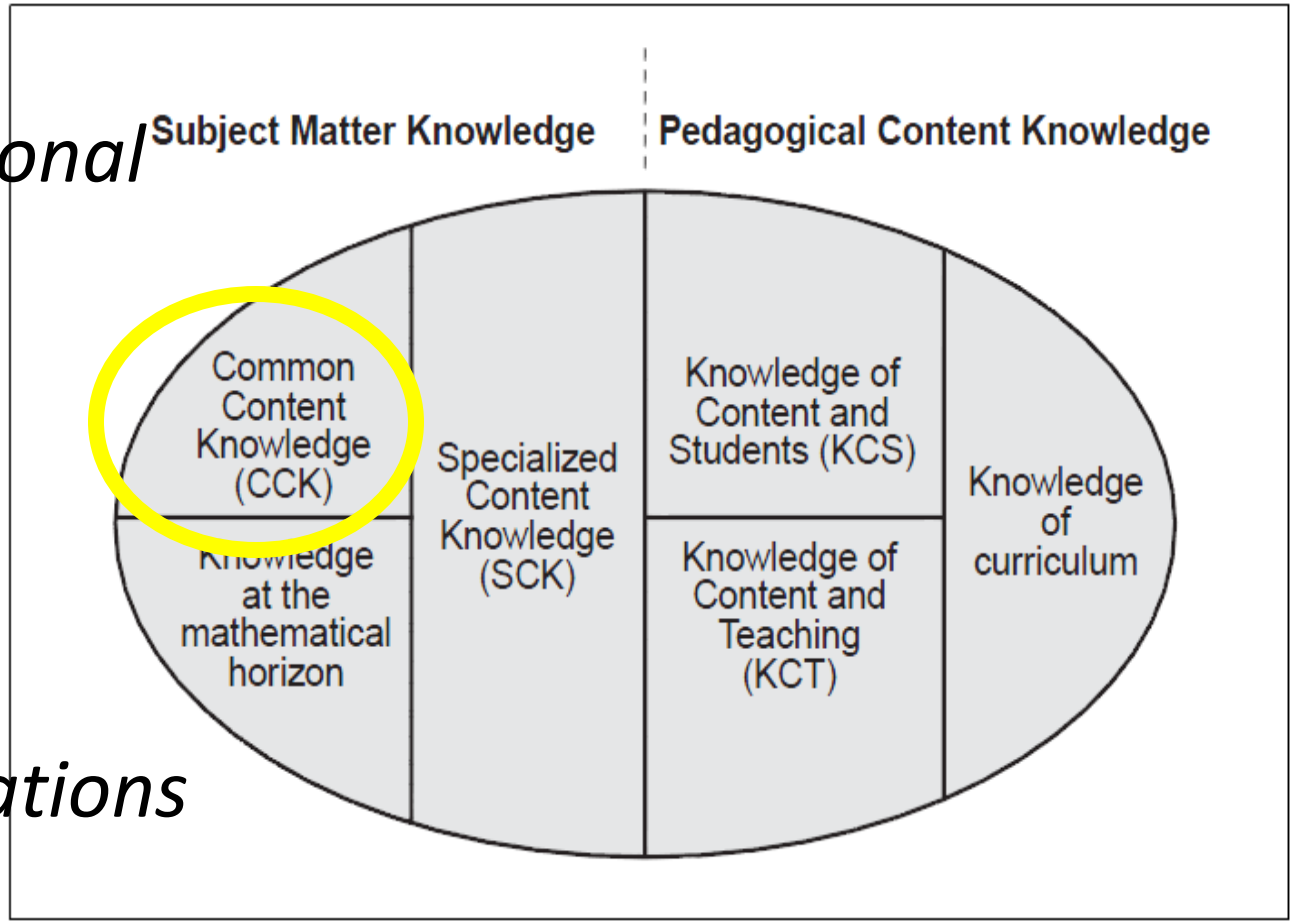
Digital media by which a user can watch and listen to audio on a computer.

Clarify misconceptions or reinforce key skills
See alternative perspective or methods
Ascertain PST MKT (our question)

Procedural Facility:

This dimension is concerned with the skill in carrying out procedures flexibly, accurately, efficiently, and appropriately.

- *Computational Accuracy*
- *Algorithm Choice*
- *Representations*

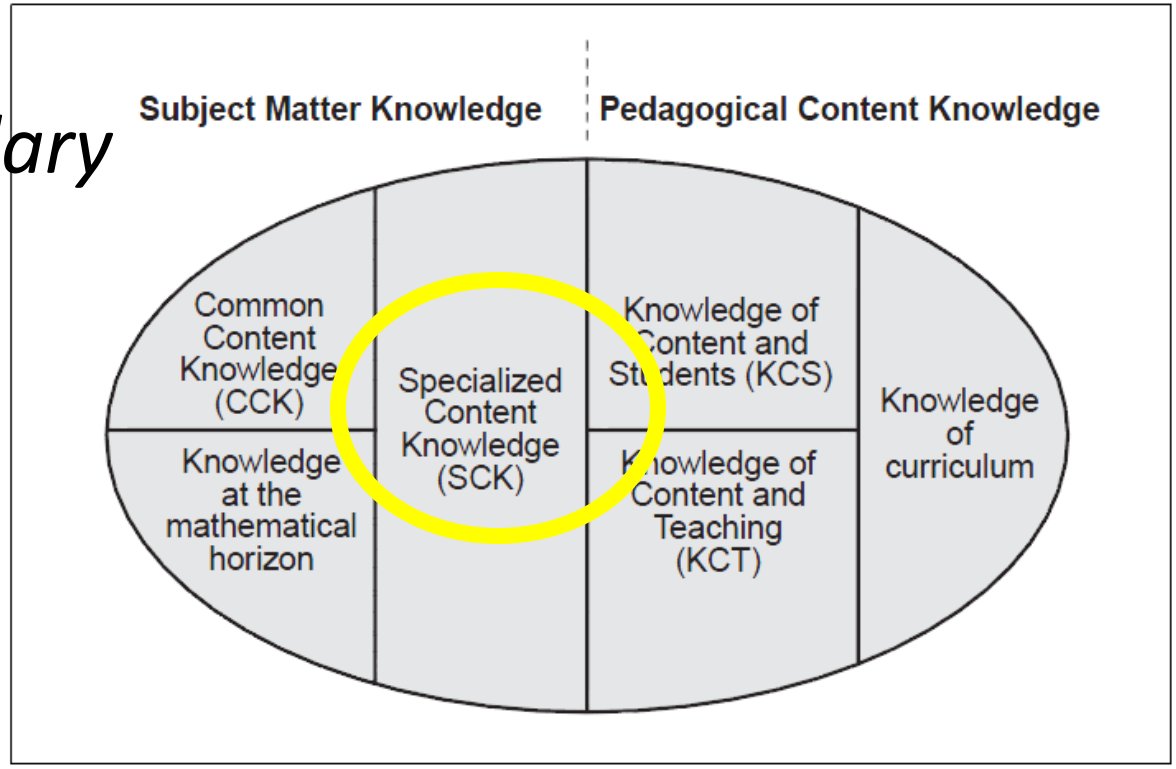


Hill, C.H., Ball, D.L, Schilling, S.G. (2008).

~~Conceptual Understanding:~~
Specialized Content Knowledge

This dimension is concerned with the comprehension of mathematical concepts, operations, and relations.

- *Use of Vocabulary*
- *Depth of Explanation*
- *Others*



Hill, C.H., Ball, D.L, Schilling, S.G. (2008).

Draft Rubric

Vocabulary

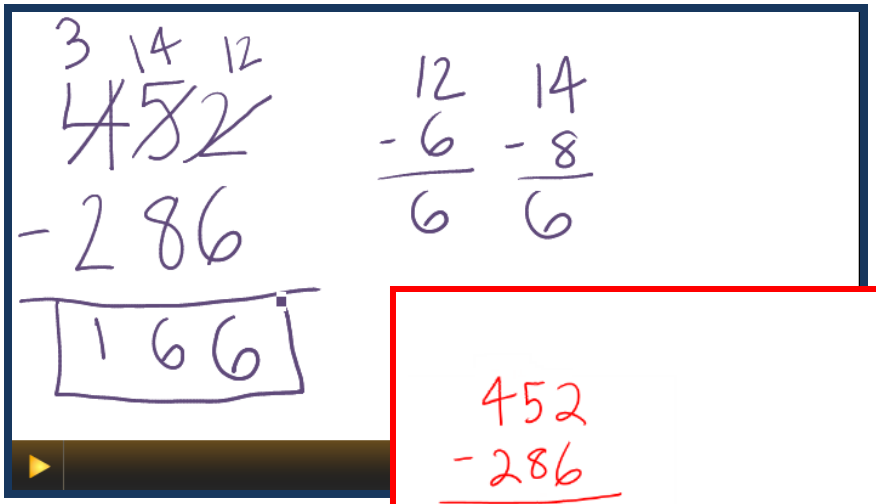
0 – Lack of consistent use of mathematical vocabulary or evidence of incorrect
1 – Minor lapses in usage of mathematical vocabulary that does not distract from understanding
2 – Mathematical vocabulary used appropriately and consistently

____ Frequently Uses the Word "Borrow" (Subtraction Problem)

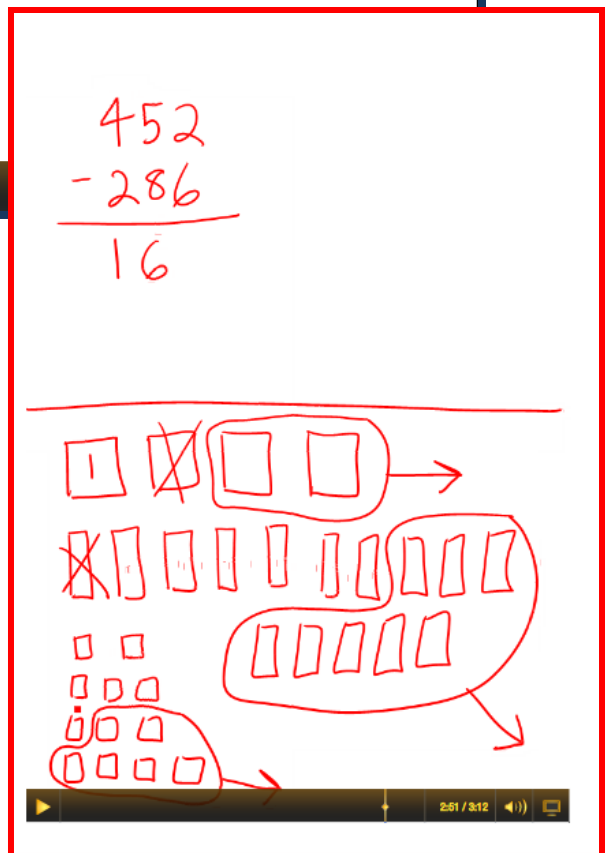
Depth of Explanation

0 – Inappropriate explanation that distracts from understanding
1 – Coherent explanation but does not give mathematical meaning to the procedure.
2 – Coherent explanation that provides mathematical meaning to the procedure.

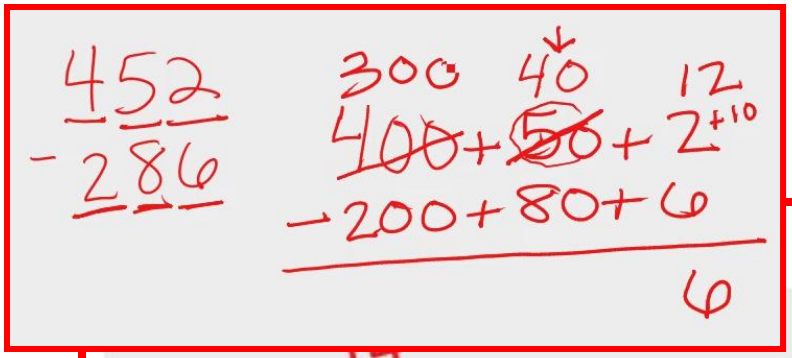
Rubric Development:
A Grounded Theory Approach

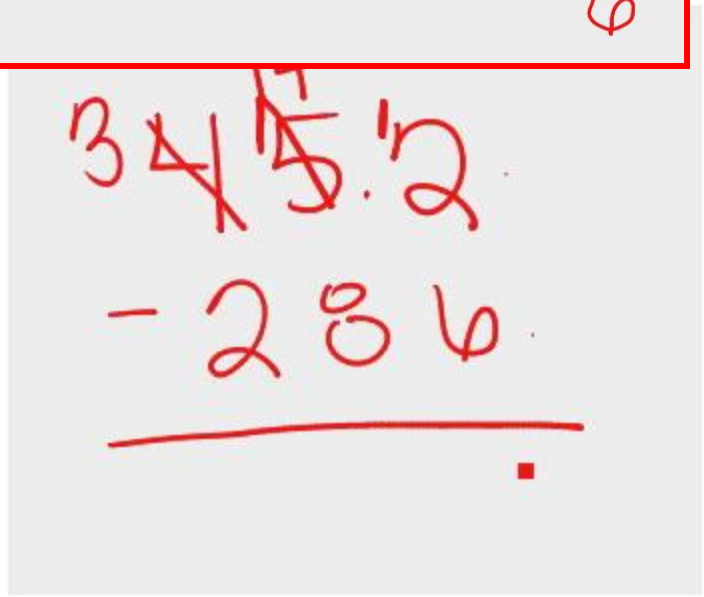


MTH 125 Pre- and Post- Podcasts



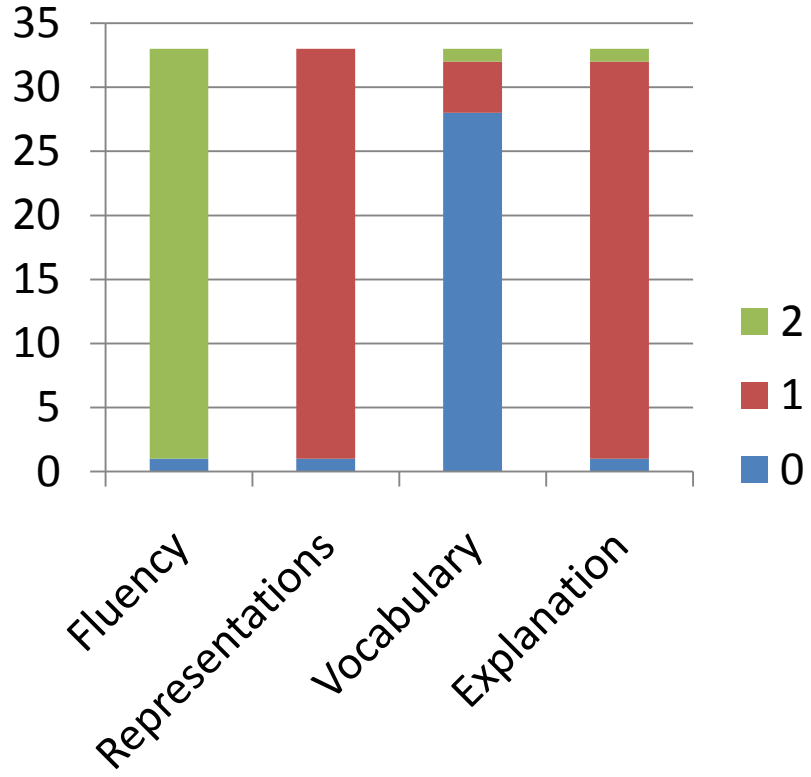
EDS 422



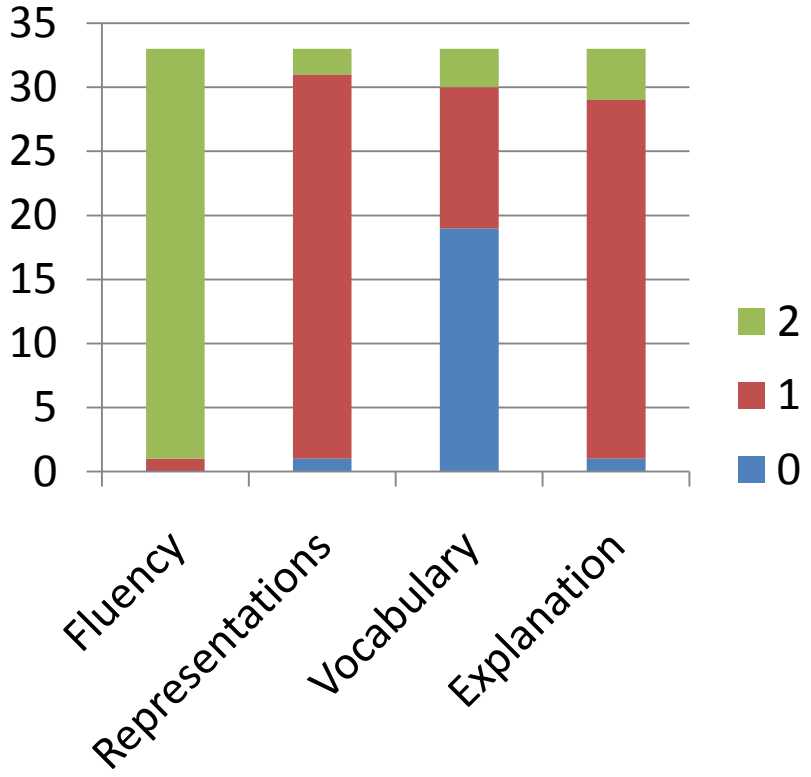


Subtraction Results
MTH 125

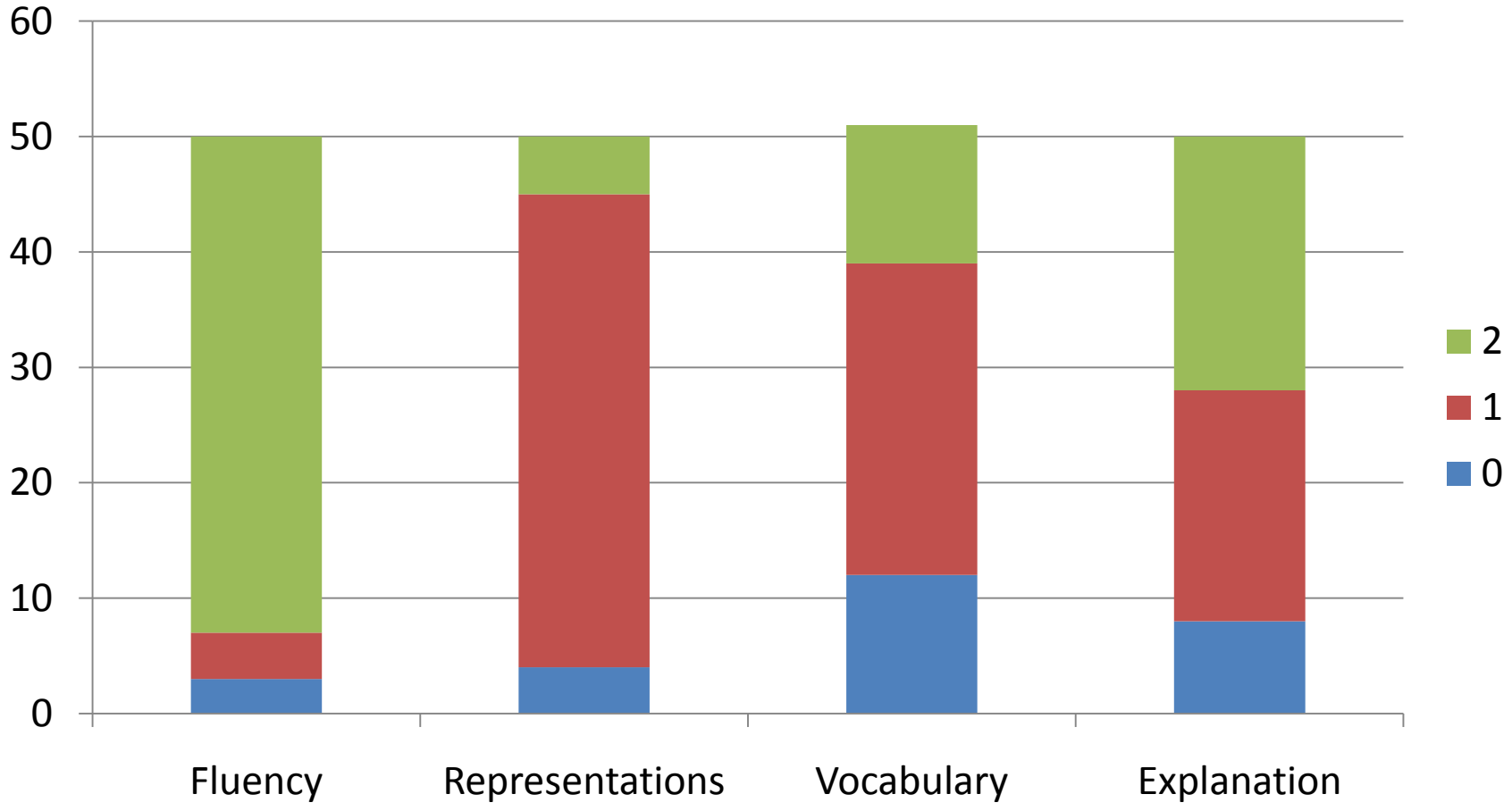
PRE-PODCASTS (SEPT)



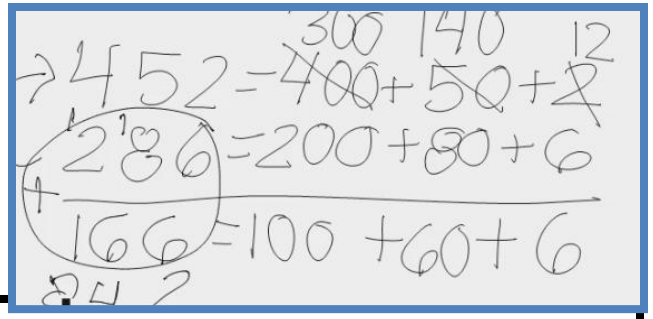
POST-PODCASTS (DEC)



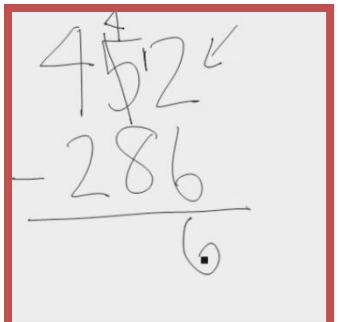
Subtraction Results
EDS 422



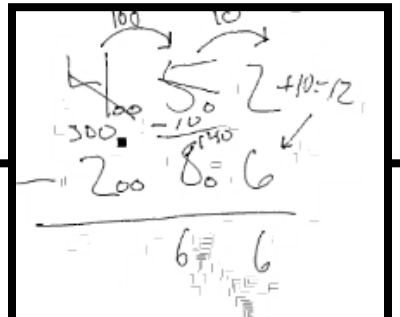
Generalized Results



- Use of traditional algorithm
- Tendency to regress back to rote methods
- Place Value language
- Misconceptions "can't take 6 from 2" or "6 minus 2" can't be done



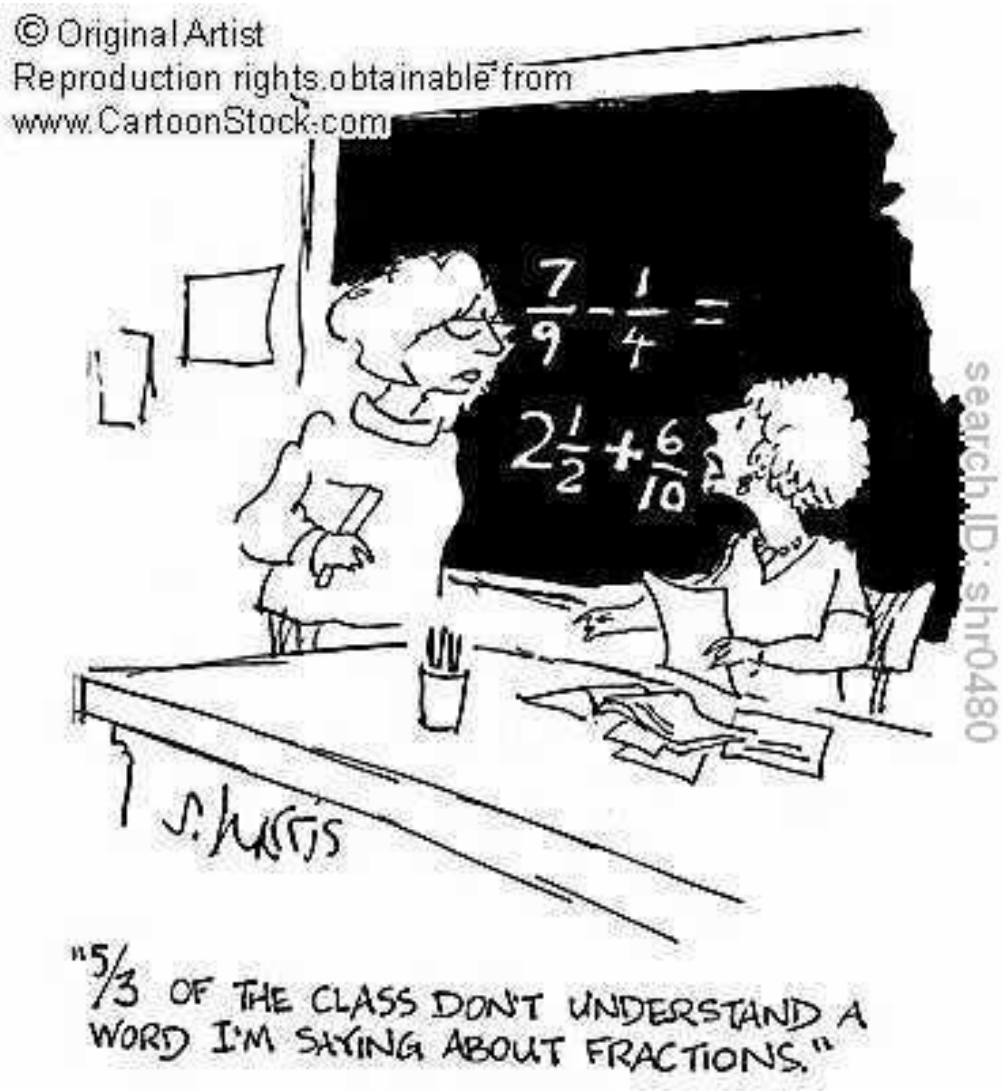
- Little connection to inverse operation
- Transition from "borrow a one from neighbor" to borrow a group of ten"
- Little connection between multiple representations.



Division of Fractions

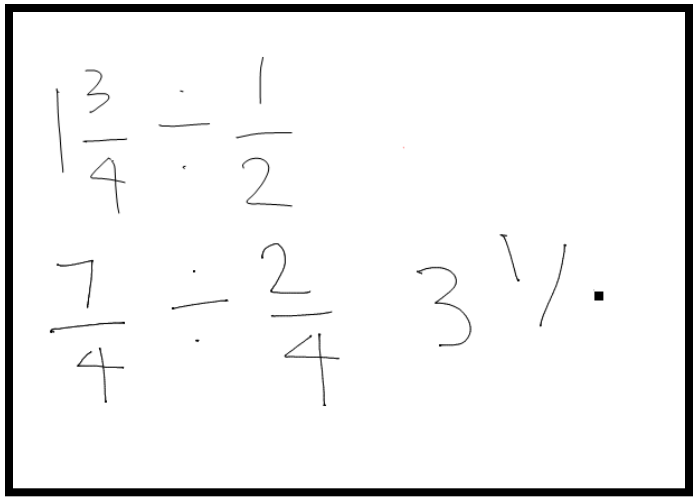
Present the following problem as though you were explaining it to a student.

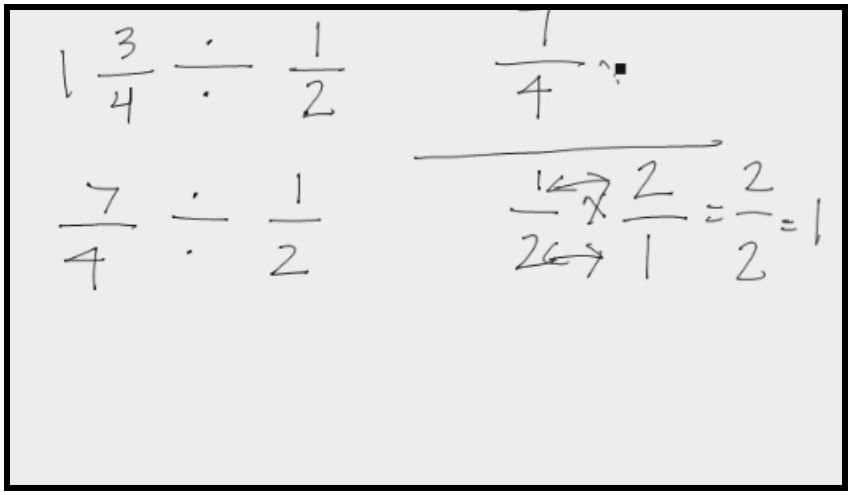
$$1\frac{3}{4} \div \frac{1}{2}$$



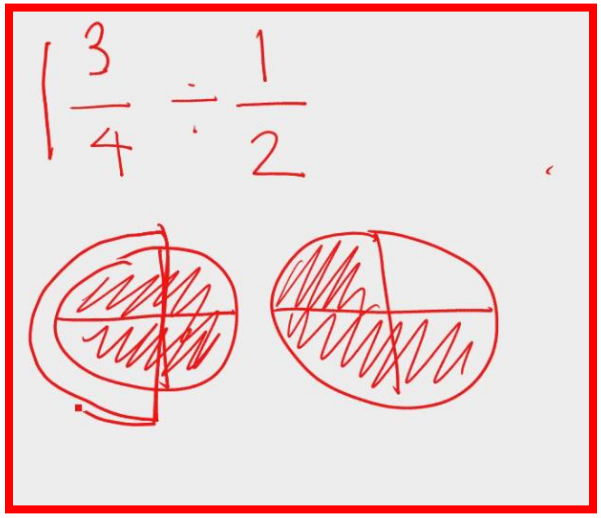
Scoring MKT

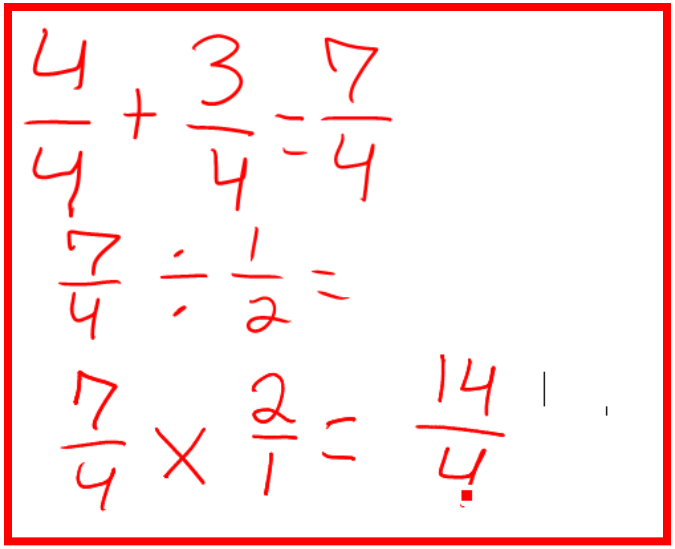
EDS 422





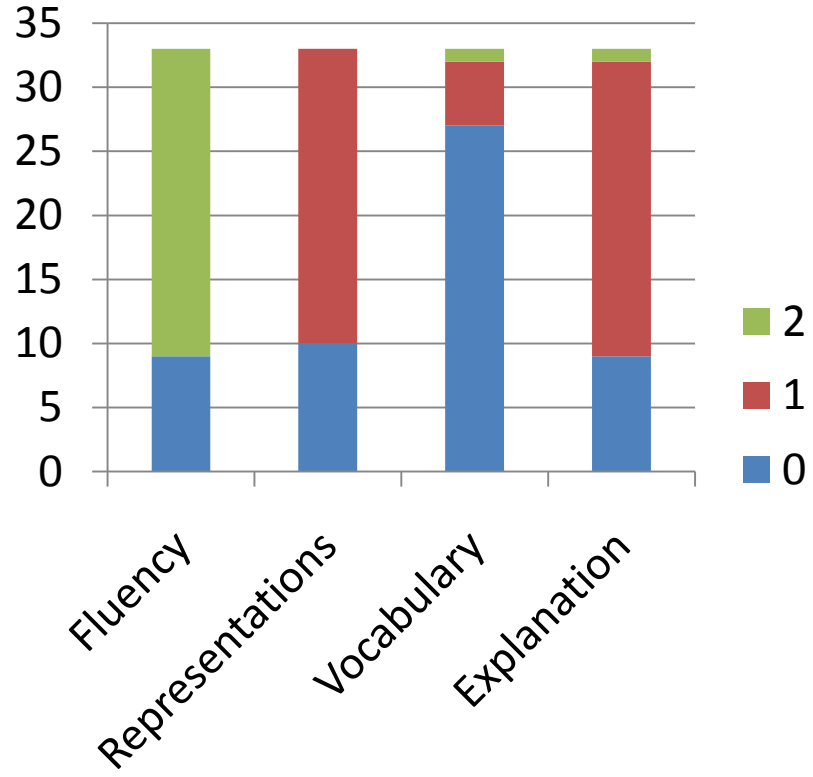
MTH 125 Pre- and Post- Podcasts



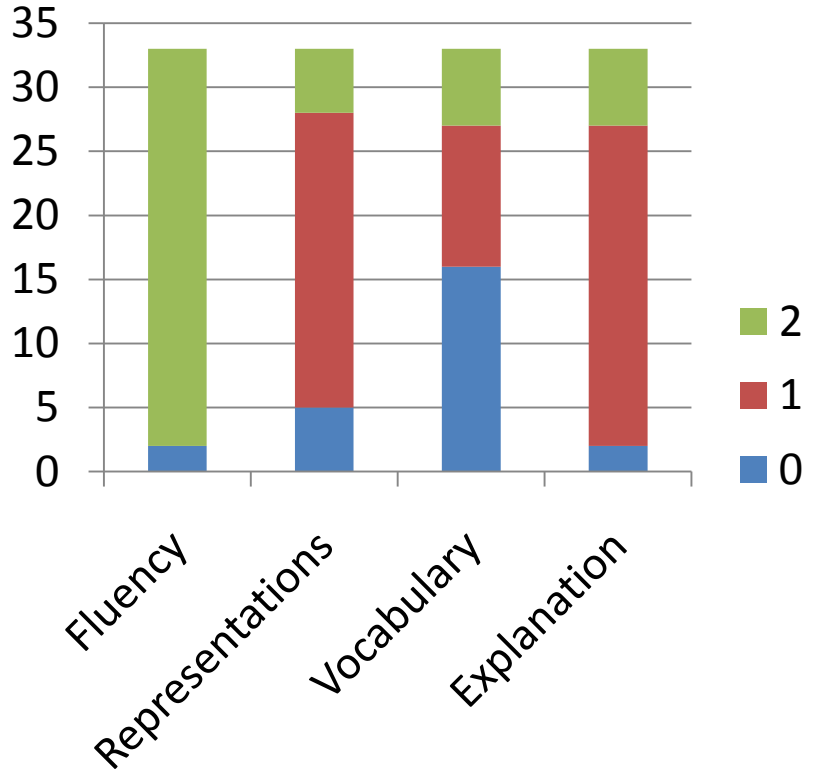


Division Results
MTH 125

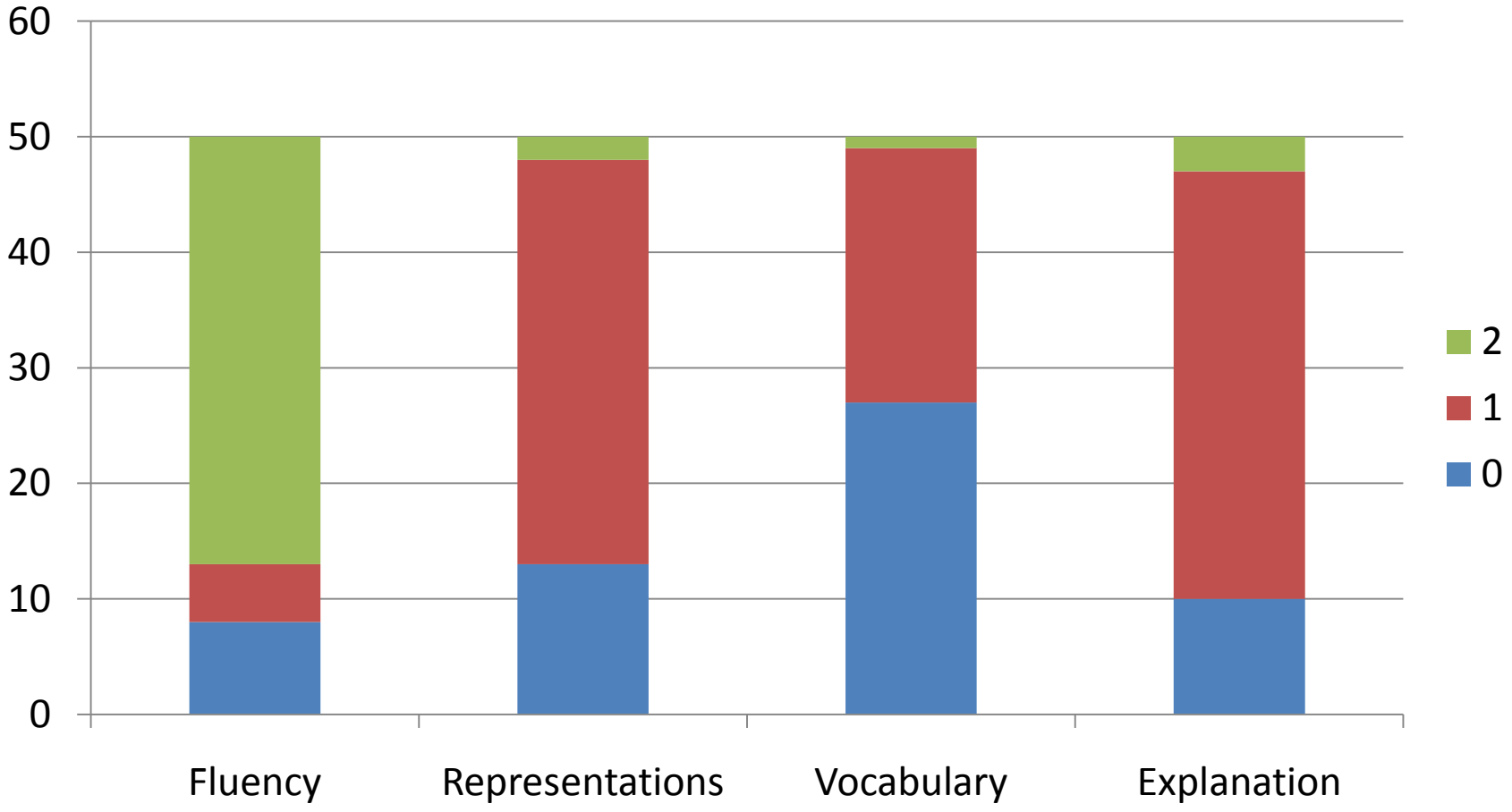
PRE-PODCASTS (SEPT)



POST-PODCASTS (DEC)

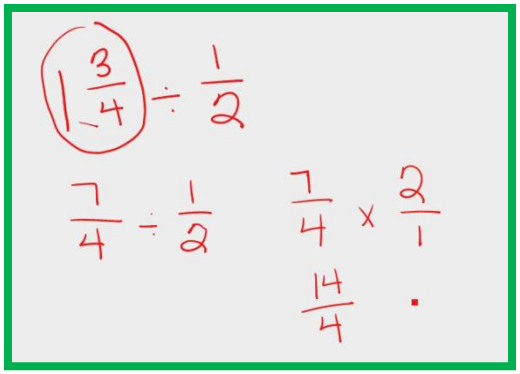


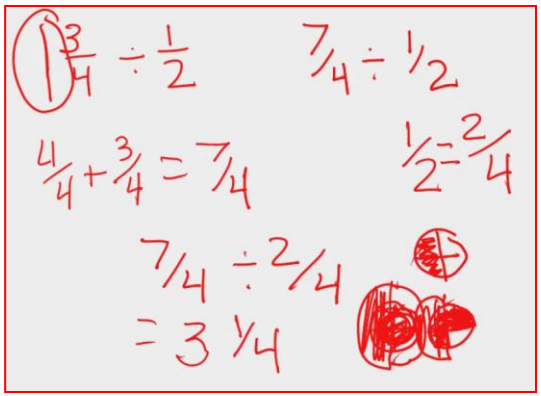
Division Results
EDS 422

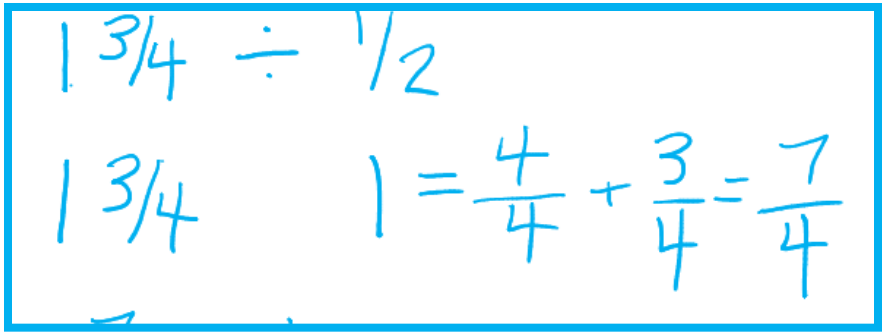


Generalized Results

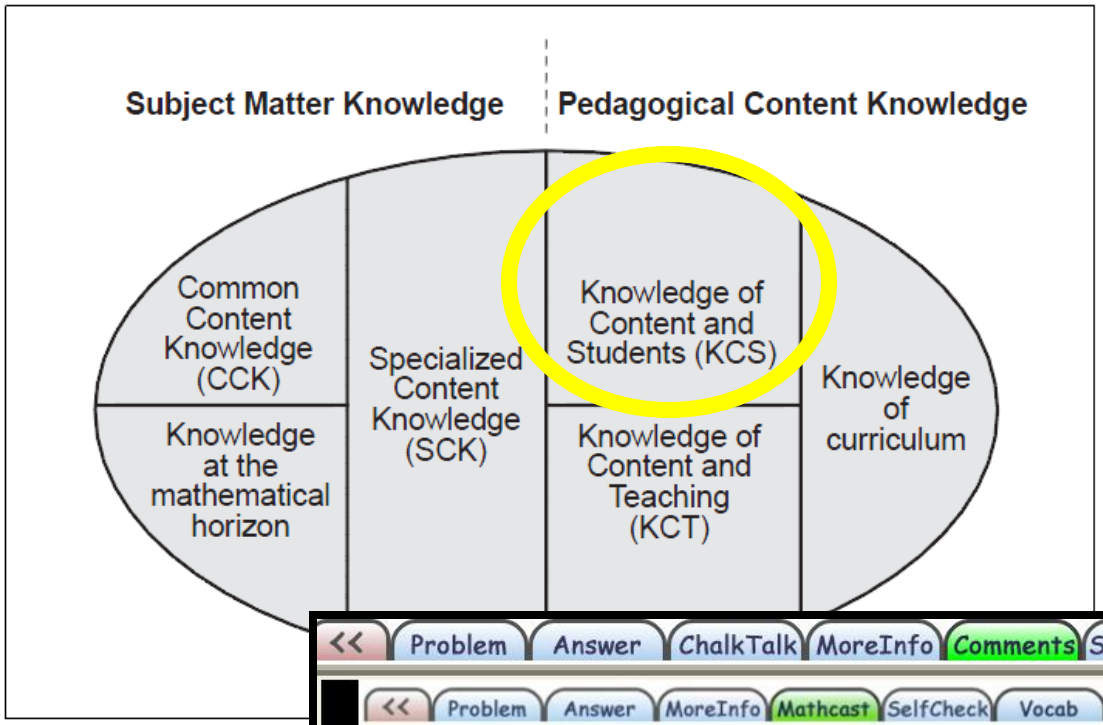
- Use of traditional algorithm for pre-podcast and methods podcasts.
- Procedural explanations
- Little link between multiple representations
- Difficulty interpreting remainder in pictorial representation
- Notational Errors

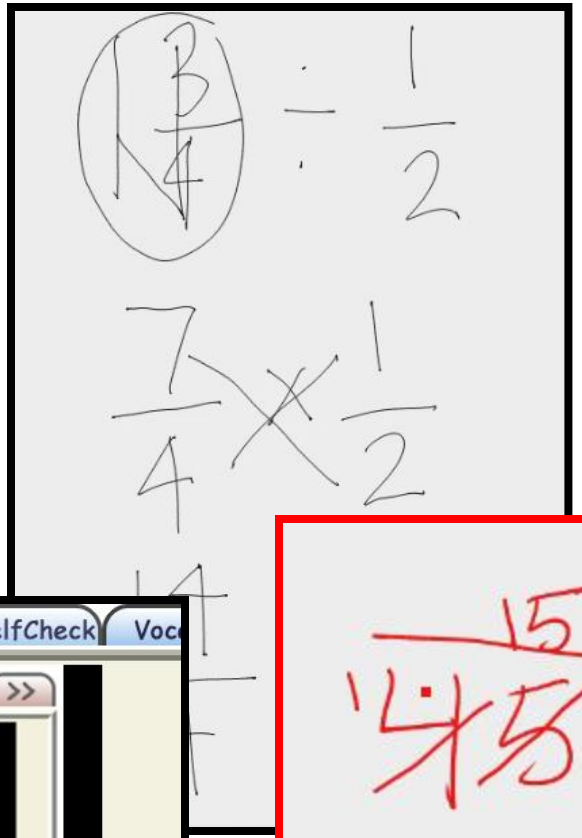


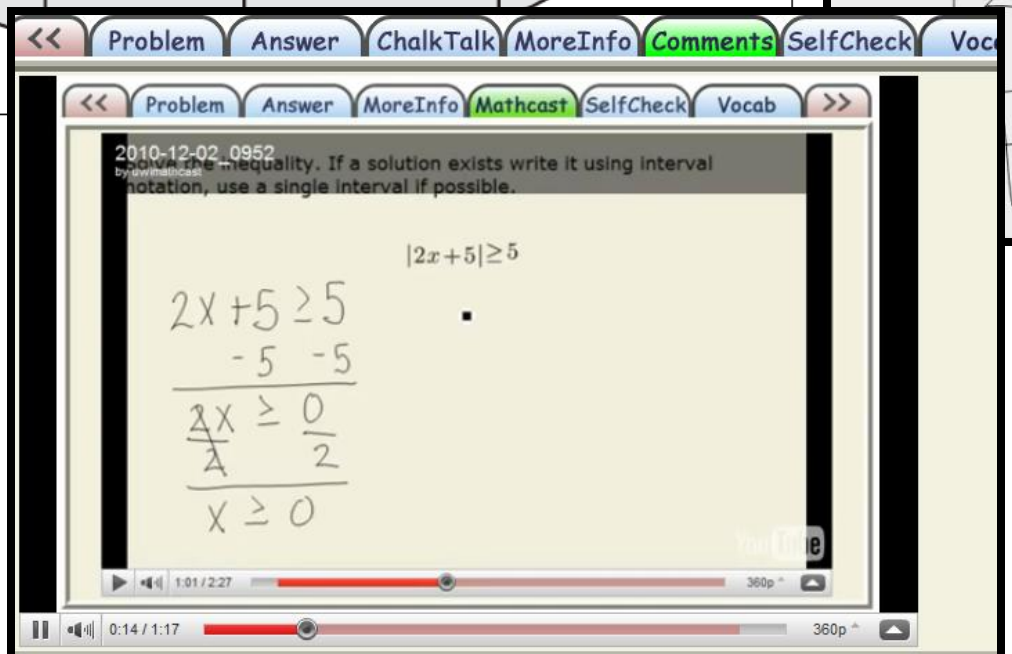


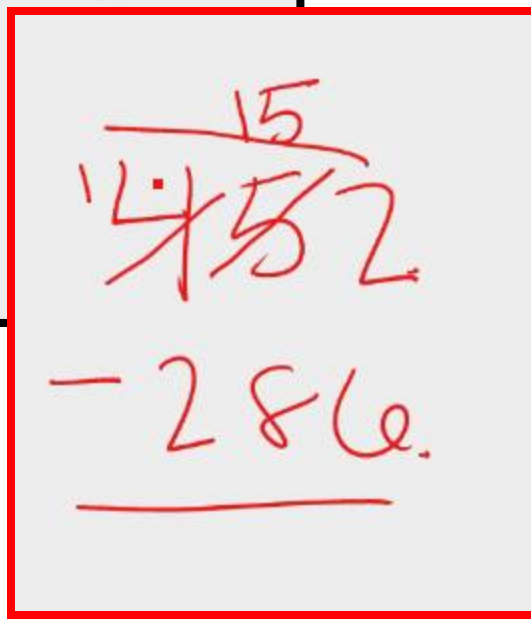


Other Projects or Uses for Podcasting?









Selected MKT References

Hill, C.H., Rowan, B., & Ball, D.L (2005). Effects of teachers' Mathematical Knowledge for Teaching on student achievement. *American Educational Research Journal, 42(2), 371-406.*

Hill, C.H., Ball, D.L, Schilling, S.G. (2008). Unpacking Pedagogical Content Knowledge: Conceptualizing and measuring teachers' topic-specific knowledge of students. *JRME, 39(4), 372-400.*

Ma, L. (1999). *Knowing and teaching elementary mathematics : teachers' understanding of fundamental mathematics in China and the United States*. Mahwah, N.J.: Lawrence Erlbaum Associates.

Shulman, L.S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14.

Thanheiser, E. (2010). Investigating further preservice teachers' conceptions of multidigit whole numbers: Refining a framework. *Educational Studies in Mathematics 75,* 241-251.

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