



Experimental Inquiry & Investigating

Ticket In

Please sign in for PLC

1/21 3rd-5th: Engaging in Cognitively Complex Tasks

1/21/2020 K-2 Cognitively Complex Tasks Part 1

Turn to page 36 in your Cognitively Complex Task workbook. Take the Student Survey.

FF: Highlight any Marzano vocabulary that stands out to you; Read CCT protocol

Student Survey for Engaging Students in Cognitively Complex Tasks

1. My teacher asks me to make predictions and test them to see if they are true.

Strongly Disagree Disagree Neither Agree Nor Disagree Agree Strongly Agree

2. I know the difference between decision-making, problem-solving, experimental, invention, and investigation tasks.

Strongly Disagree Disagree Neither Agree Nor Disagree Agree Strongly Agree

3. My teacher asks me questions to help me figure out what kind of task is most appropriate for me.

Strongly Disagree Disagree Neither Agree Nor Disagree Agree Strongly Agree

4. When I am working on a task that involves generating and testing a hypothesis, I can explain what my hypothesis is and what I am doing to test it.

Strongly Disagree Disagree Neither Agree Nor Disagree Agree Strongly Agree

5. The products that I create during tasks that involve generating and testing a hypothesis show that I have deepened my learning about a topic.

Strongly Disagree Disagree Neither Agree Nor Disagree Agree Strongly Agree

6. At the end of a task that involves generating and testing a hypothesis, I can explain if my hypothesis was proved or disproved and why.

Strongly Disagree Disagree Neither Agree Nor Disagree Agree Strongly Agree

Marzano Focused Teacher Evaluation Model

Standards-Based Classroom with Rigor



Standards-Based Planning

- Planning Standards-Based Lessons/Units
- Aligning Resources to Standard(s)
- Planning to Close the Achievement Gap Using Data

Conditions for Learning

- Using Formative Assessment to Track Progress
- Providing Feedback and Celebrating Progress
- Organizing Students to Interact with Content
- Establishing and Acknowledging Adherence to Rules and Procedures
- Using Engagement Strategies
- Establishing and Maintaining Effective Relationships in a Student-Centered Classroom
- Communicating High Expectations for Each Student to Close the Achievement Gap

Standards-Based Instruction

- Identifying Critical Content from the Standards
- Previewing New Content
- Helping Students Process New Content
- Using Questions to Help Students Elaborate on Content
- Reviewing Content
- Helping Students Practice Skills, Strategies, and Processes
- Helping Students Examine Similarities and Differences
- Helping Students Examine Their Reasoning
- Helping Students Revise Knowledge
- Helping Students Engage in Cognitively Complex Tasks

Professional Responsibilities

- Adhering to School and District Policies and Procedures
- Maintaining Expertise in Content and Pedagogy
- Promoting Teacher Leadership and Collaboration

Learning Target

Teachers will develop understanding of Cognitively Complex Tasks (CCT) by:

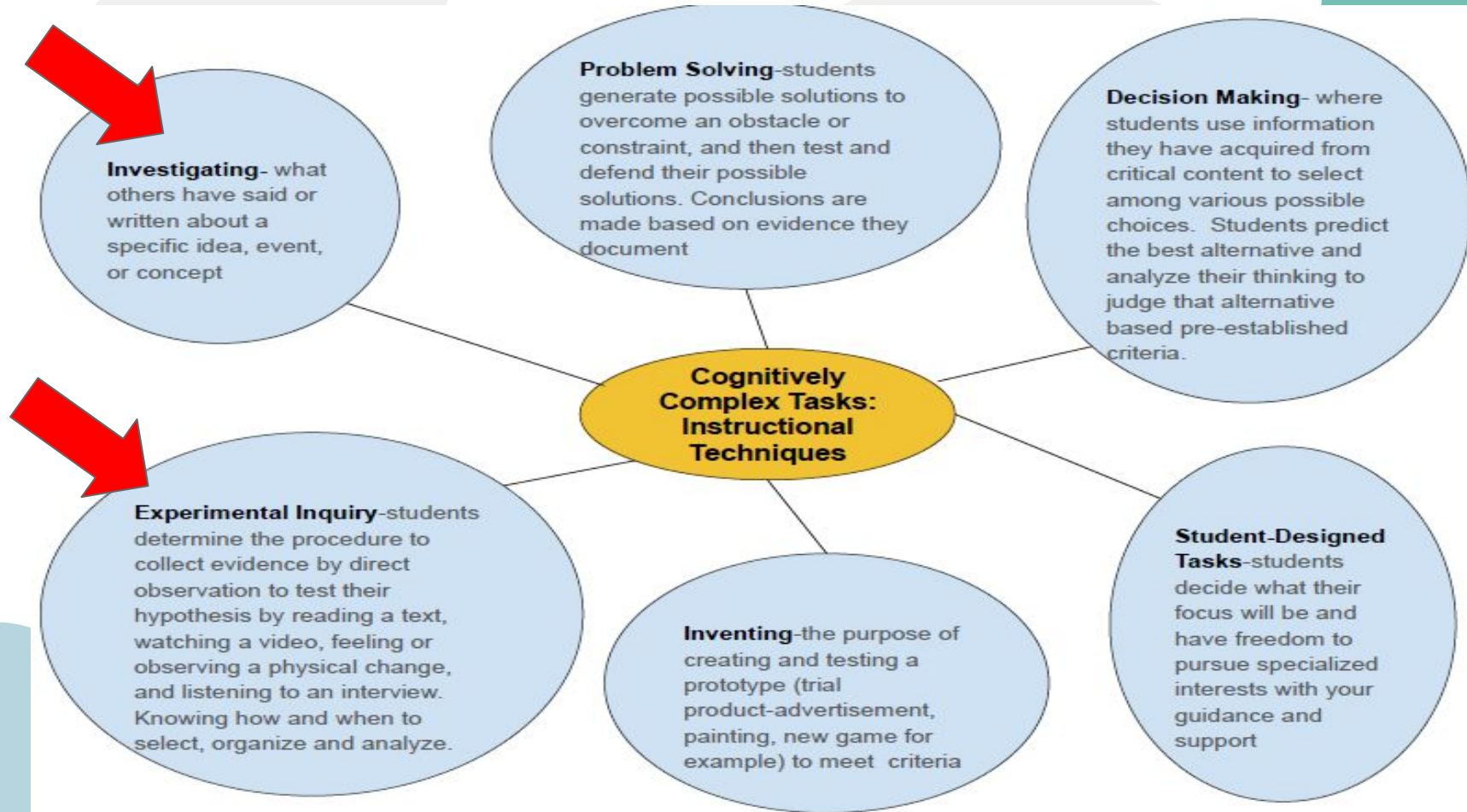
- examining the types of Cognitively Complex Tasks (techniques)
- participating in an Experimental Inquiry Cognitively Complex task

Helping Students Engage in Cognitively Complex Tasks

Focus Statement: Teacher coaches and supports students in complex tasks that require experimenting with the use of their knowledge by generating and testing a proposition, a theory, and/or a hypothesis.

Desired Effect: Evidence (formative data) demonstrates students prove or disprove the proposition, theory, or hypothesis.

Types of Cognitively Complex Tasks



Types of Cognitively Complex Tasks



Investigating- what others have said or written about a specific idea, event, or concept

Both types of Cognitively Complex techniques ask students to test Hypothesis



Experimental Inquiry- determine the procedure to collect evidence by direct observation to test their

Problem Solving-students generate possible solutions to

Decision Making- where

based pre-established criteria.

Student-Designed Tasks-students decide what their

Desired Effect: Evidence (formative data) demonstrates students prove or disprove the proposition, theory, or hypothesis.

Knowing how and when to select, organize and analyze.

product development, painting, new game for example) to meet criteria

guidance and support

Turn, Talk, & Watch



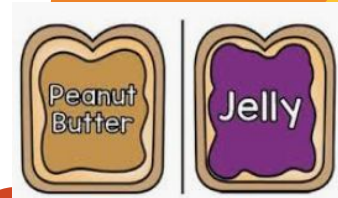
-What is a hypothesis?



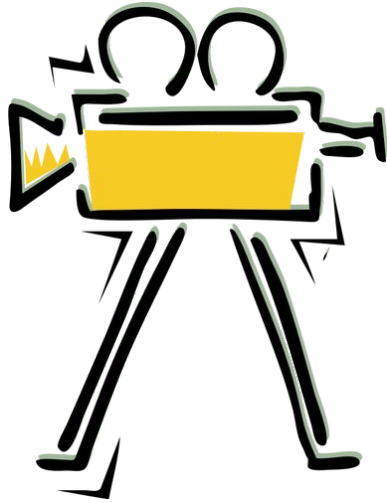
-Agree? Can you add on?



-What do you think
generating hypothesis looks
like with your students in
ELA and Math?



Turn, Talk, & Watch



-How did teacher engage students in creating hypothesis for a math lesson?



Let's try CCT! Identify Learning Target

1.OA.D.8

Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 + ? = 11$, $5 = _ - 3$, $6 + 6 = _$.

4

- Justify the unknown whole number in an addition or subtraction equation relating three whole numbers.

3

- Determine the unknown whole number in an addition or subtraction equation relating three whole numbers.

2

- Determine the unknown whole number in an addition equation.
Determine the unknown whole number in a subtraction equation.

1

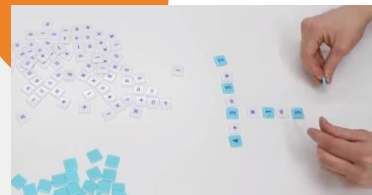
- With the teachers help, students will have partial success at levels 2 and 3.



Let's try CCT! Demonstration

Begin CCT with demonstration or observation to spark students' hypotheses
Missing operations!

I wanted to play Mobi but the operation tiles are missing. Can you help create equations so the number sentences make sense?



Hypothesis

Hypothesis (Prediction)

What operation can you use to manipulate these numbers so the number sentence is true?

I predict

3 2 5 10



Let's try CCT! Test

*How can you prove your hypothesis?

3 2 5 10

*Did you disprove your hypothesis?



Background Knowledge

A collage of educational cards for background knowledge. The cards include:

- DOUBLES PLUS ONE**: A card with a number line and examples: $1+1=2$, $2+2=4$, $3+3=6$. It says "Start with doubles!" and "Now add one!" with examples: $3 + \textcircled{4} = 7$, $3+4=3+3+1$, $=6+1$, $=7$.
- Counting on with the BIG NUMBER**: A card showing a number line starting at 1 and counting on to 2.
- Count On or Back**: A card showing a number line with 9, 10, 11, 12, 13 and arrows indicating counting on and back.
- Hundreds Chart**: A 10x10 grid of numbers from 1 to 100.

Background Knowledge

DOUBLES PLUS ONE



Start with doubles!

Now add one!

$$\begin{array}{c} 3 + 4 = 7 \\ \begin{array}{cc} \textcircled{3} & \textcircled{1} \end{array} \end{array} \quad \begin{array}{l} 3+4=3+3+1 \\ =6+1 \\ =7 \end{array}$$

You know
doubles?

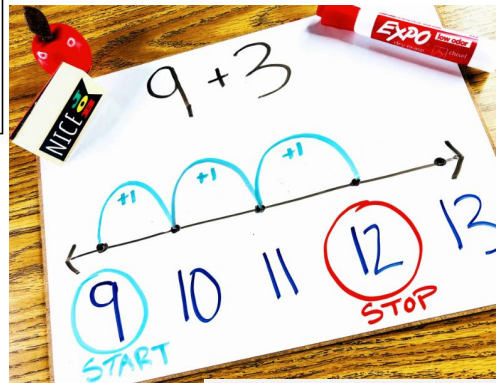


1+1=2
2+2=4
3+3=6
4+4=8
5+5=10
6+6=12
7+7=14
8+8=16
9+9=18
10+10=20

Just
add one!



1+2=3
2+3=5
3+4=7
4+5=9
5+6=11
6+7=13
7+8=15
8+9=17
9+10=19
10+11=21



Our Hundreds Chart

| | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |

Count On or Back

Examine & Evaluate

Grounds and Backing

*How can you prove your hypothesis?

3 2 5 10



Qualifiers

*Did you disprove your hypothesis?

Grounds

*Why I think it is true? Give Reasons

Backing

*What I actually observed? Explains and justifies the grounds

Qualifiers

*When might this not work? Any exceptions or alternate approaches

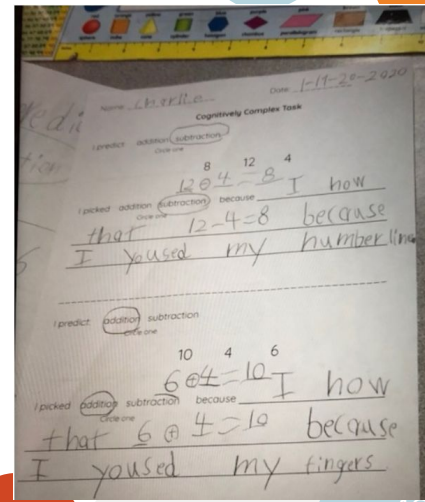
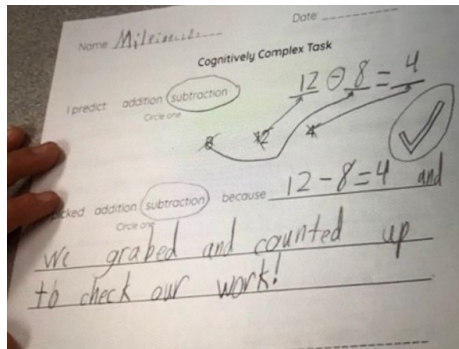
Let's try it! Conclusion



How did you prove or justify that you had the right answer? Be sure to restate your Hypothesis

Has this CCT added to or changed your prior thinking?

Reflect on Process



Key Components of CCT: Experimental Inquiry

*Identify Learning Target

*Demonstration/Observation Hook

*Question

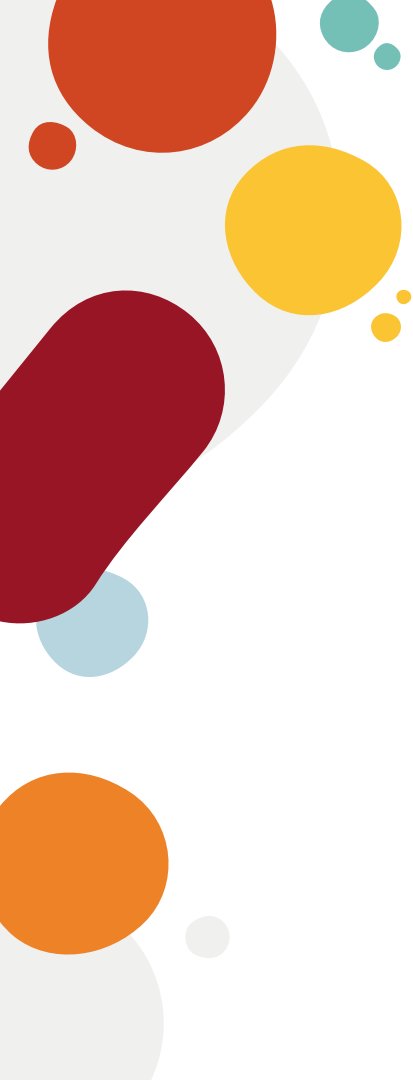
*Hypothesis

*Test

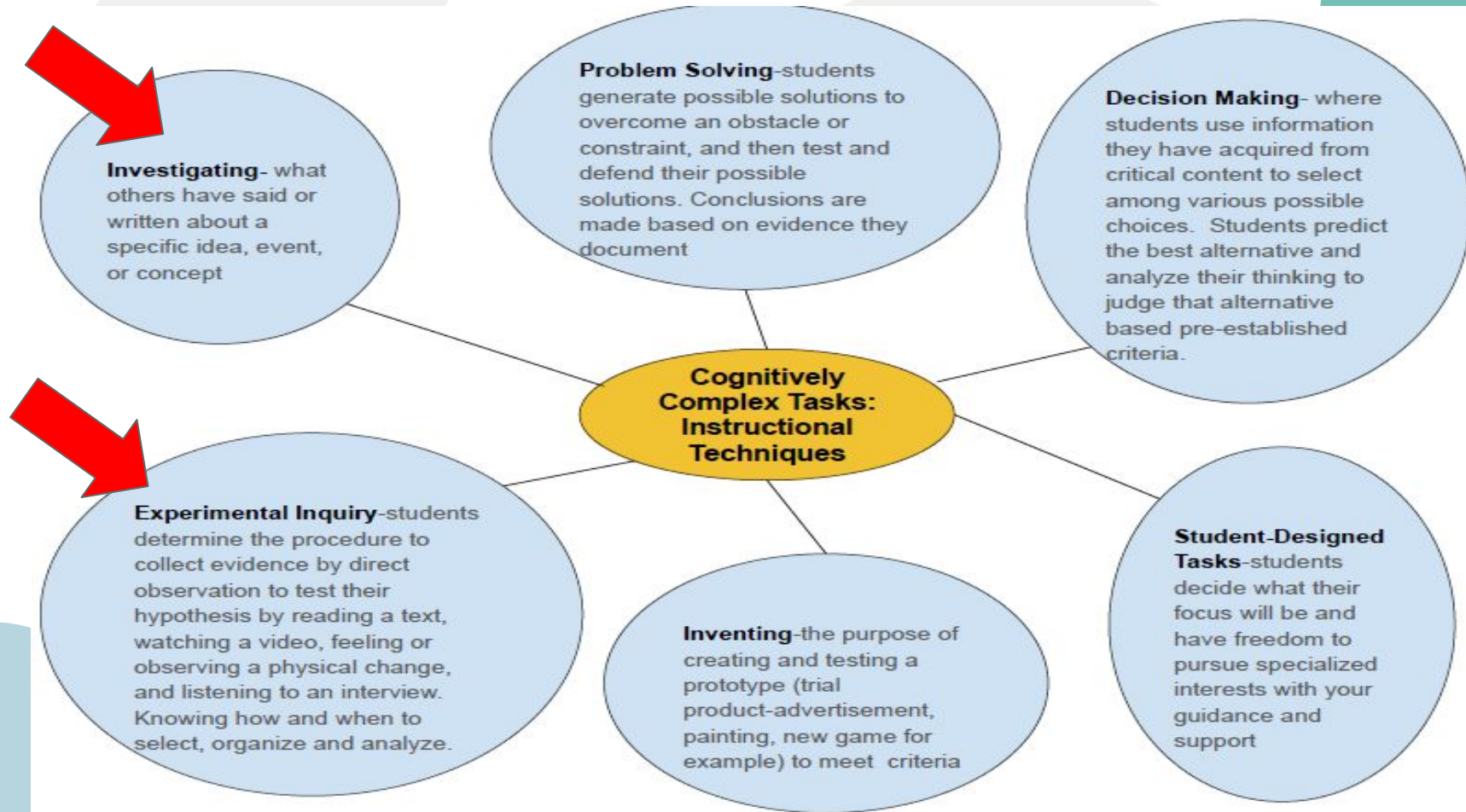
*Examine & Evaluate Results Back with evidence

*Conclusion

**Prove or
disprove
hypothesis**



Investigating Cognitively Complex Tasks



Investigating CCT

Students generate and test a hypothesis by investigating what others have said or written about a specific idea, event, or concept

**Prove or
disprove
hypothesis**

Let's try CCT! Identify Learning Target

Learning Targets *(write targets from each level of the scale below)*

| 2.0 Foundational Knowledge & Skills *Level of Taxonomy | 3.0 Learning Target/Objective *Level of Taxonomy | 4.0 More Complex Knowledge *Level of Taxonomy |
|--|---|--|
| I know and can define poems, dramas, or prose and the structural elements of each. *Retrieval | Explain the overall structure and major differences between poetry, drama and prose. *Analysis | I can construct an argument to defend a claim about a poem, drama, or prose. *Knowledge Utilization |

Claim/Hypothesis



Which type of text will best support the importance of spending money wisely?

Prose, Poetry or Drama

Prove it! Identify what is known

Students state what they hope to prove in investigation (based on previously learned knowledge about subject or event) and provide evidence from what others said (grounds/backing)




Grandfather's Coin

Every month, Julia and her cousins would go for the big family meal at their grandparents' house. They would always wait excitedly for the moment their grandfather would give them a few coins, "so you can buy yourself something." Then all the children would run off to buy chewing gum, lollipops, or gum drops. The grandparents, aunts, uncles, and parents commented that, behaving like this, the children would never learn to manage their money. So they proposed a special test, in which the children would have to show, over the course of a year, just what they could manage to get with those few coins.

Some of the children thought that they would save their money, but Ruben and Nico, the two smallest kids, paid no attention, and they continued spending it all on sweets. Every time, they would show off their sweets in front of the other children, laughing and making fun of their cousins. They made Clara and Joe so angry that they could no longer stand to keep saving their money. They joined Ruben and Nico in spending whatever they had, quickly, on sweets.

Alex had a strong will. He saved and saved all the money he was given, wanting to win the competition, and at the end of the year he had collected more money than anyone. Even better, with so much money, he managed to buy sweets at a reduced price, so that on the day of the competition he presented enough sweets to last for much more than a year. And even then, he still had enough money left over for a toy. He was the clear winner, and the rest of his cousins learned from him the advantages of knowing how to save and how to wait.

 **Smart**

My dad gave me one dollar bill
'Cause I'm his smartest son,
And I swapped it for two shiny
quarters.
'Cause two is more than one!


And then I took the quarters
And traded them to Lou
For three dimes -- I guess he don't
know
That three is more than two!

Just then, along came old blind Bates
And just 'cause he can't see
He gave me four nickels for my three
dimes,
And four is more than three!

And I took the nickels to Hiram
Cosmides
Down at the seed-feed store,
And the fool gave me five pennies for
them,
And five is more than four!

And then I went and showed my dad,
And he got red in the cheeks
And closed his eyes and shook his
head--
'Too proud of me to speak!

-Shel Silverstein



T or S given

Prove it! Identify confusion or contradictions

Students identify any errors in reasoning or logic (qualifiers)



Smart



My dad gave me one dollar bill
'Cause I'm his smartest son,
And I swapped it for two shiny
quarters
'Cause two is more than one!



And then I took the quarters
And traded them to Lou
For three dimes-- I guess he don't
know
That three is more than two!



Just then, along came old blind Bates
And just 'cause he can't see
He gave me four nickels for my three
dimes,
And four is more than three!



And I took the nickels to Hiram
Coombs
Down at the seed-feed store,
And the fool gave me five pennies for
them,
And five is more than four!



And then I went and showed my dad,
And he got red in the cheeks
And closed his eyes and shook his
head--
Too proud of me to speak!

- Shel Silverstein

Grandfather's Coin

Every month, Julia and her cousins would go for the big family meal at their grandparents' house. They would always wait excitedly for the moment their grandfather would give them a few coins, "so you can buy yourself something." Then all the children would run off to buy chewing gum, lollipops, or gum drops. The grandparents, aunts, uncles, and parents commented that, behaving like this, the children would never learn to manage their money. So they proposed a special test, in which the children would have to show, over the course of a year, just what they could manage to get with those few coins.

Some of the children thought that they would save their money, but Ruben and Nico, the two smallest kids, paid no attention, and they continued spending it all on sweets. Every time, they would show off their sweets in front of the other children, laughing and making fun of their cousins. They made Clara and Joe so angry that they could no longer stand to keep saving their money. They joined Ruben and Nico in spending whatever they had, quickly, on sweets.

Alex had a strong will. He saved and saved all the money he was given, wanting to win the competition, and at the end of the year he had collected more money than anyone. Even better, with so much money, he managed to buy sweets at a reduced price, so that on the day of the competition he presented enough sweets to last for much more than a year. And even then, he still had enough money left over for a toy. He was the clear winner, and the rest of his cousins learned from him the advantages of knowing how to save and how to wait.

Conclusion

Students respond to original claim

*supported by interpretation of evidence collected

*resolves any confusing or conflicting information



Key Components of CCT: Investigating

- *Identify Learning Target

- *State Claim/Hypothesis

- *Prove with evidence

 - identify what is known & supports claim (Grounds & Backing)

 - identify what is confusing or conflicting information

- *Conclusion

 - responds to original prompt (supported by interpretation of evidence collected or resolves any confusing conflicting information)

**Prove or
disprove
hypothesis**

Ticket Out

Kasey is a 4th grade student. She DOES NOT write a hypothesis but DOES prove what she is thinking using evidence.

Is Kasey participating in a Cognitively Complex Task? Why or Why not?

Goal of Hypothesis

The goal of hypothesis generation and testing is that students will learn how to examine what they personally know or think about a topic. If you tell your students what to think and how to conduct a cognitively complex task, you will be doing their thinking for them.” Page 12

