Number Talks 101
Professional Learning Series

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Number Talks Cheat Sheet

What does Number Talks look like?

- Students are near each other so they can communicate with each other (central meeting place)
- Students are mentally solving problems
- Students are given thinking time
- Thumbs up show when they are ready
- Teacher is recording students' thinking

Communication

- Having to talk out loud about a problem helps students clarify their own thinking
- Allow students to listen to other's strategies and value other's thinking
- Gives the teacher the opportunity to hear student's thinking

Mental Math

- When you are solving a problem mentally you must rely on what you know and understand about the numbers instead of memorized procedures
- You must be efficient when computing mentally because you can hold a lot of quantities in your head

Thumbs Up

- This is just a signal to let you know that you have given your students enough time to think about the problem
- If will give you a picture of who is able to compute mentally and who is struggling
- It isn't as distracting as a waving hand

Teacher as Recorder

- Allows you to record students' thinking in the correct notation
- Provides a visual to look at and refer back to
- Allows you to keep a record of the problems posed and which students offered specific strategies

Purposeful Problems

- Start with small numbers so the students can learn to focus on the strategies instead of getting lost in the numbers
- Use a number string (a string of problems that are related to and scaffold each other)

Starting Number Talks in your Classroom

- Start with specific problems in mind
- Be prepared to offer a strategy from a previous student
- It is ok to put a student's strategy on the backburner
- Limit your number talks to about 15 minutes
- Ask a question, don't tell!

The teacher asks questions:

- Who would like to share their thinking?
- Who did it another way?
- How many people solved it the same way as Billy?
- Does anyone have any questions for Billy?
- Billy, can you tell us where you got that 5?
- How did you figure that out?
- What was the first thing your eyes saw, or your brain did?
- What are Number Talks and Why are they

Strategies by Grade Level

Grade	Addition	Subtraction
K	Counting all/counting on Making tens	Counting back Adding up
1	Counting all/counting on Doubles/near doubles Making tens landmark numbers Breaking up number into their place value Adding up in chunks	Adding up Removal in parts
2	Counting all/counting on Doubles/near doubles Making tens landmark numbers Breaking up number into their place value Adding up in chunks	Adding up Removal in parts
3	Breaking numbers into their place value Adding up in chunks Compensation adjusting 1 number to create an easier Problem using a landmark number	Adding up Negative numbers Constant difference Adjusting 1 number to make an easier problem Number line Part - whole box model
	Repeated addition Skip counting Doubling and halving making an array as a model Partial products Using landmark numbers	

Students need to understand that:

- Numbers are composed of smaller numbers.
- Numbers can be taken apart and combined with other numbers to make new numbers.
- What we know about one number can help us figure out other numbers.
- What we know about parts of smaller numbers can help us with parts of larger numbers.
- Numbers are organized into groups of tens and ones (and hundreds, tens and ones and so forth.)
- What we know about numbers to 10 helps us with numbers to 100 and beyond

Number Talk – Defining Features

The chart below outlines some of the core features of a Number Talk that distinguish it from any other mathematical discussion about a problem.

Facilitation Feature	Student Experience
Problems are written and read publicly, but students solve mentally (no pencil and paper or white boards)	• Students develop efficiency, accuracy and fluency with mathematical thinking using mental math. • Students move away from a reliance on standard algorithms and strict memorization, and move into sense-making and sharing their reasoning around the mathematics.
Wait time	• All students have time to reflect upon and struggle with mental math and/or come up with multiple ways of solving
Silent signals as mode of response ("I have an answer" "I have 2 strategies"…) Silent validation of who got the same answer / who agrees or disagrees with an answer	• Students are not distracted by hands in the air, or by others who have found an answer quickly and want to share immediately. • Students are motivated to come up with more than one way of solving. Emphasis is placed on the thinking process more than the answer itself. • Students interact with each other, not just with the teacher
Surface all answers up front, including mistakes	• Mistakes are treated as learning opportunities • Students agree with and/or critique the reasoning of others
Turn and Talk (optional)	• Every student has an opportunity to share her/his way of thinking about and solving the problem • Students articulate ideas with a partner before engaging in large group academic discussion
Teacher begins scribing /representing student's strategy *after* student has finished explaining and without steering student in a particular direction. Teacher confirms with the presenter that his/her thinking is properly represented.	• Multiple strategies are made public • Students see different ways to record a mental process • Scribing reflects student's actual process, and not a specific, anticipated solution path • Students feel ownership of their own strategies
Engagement /participation /comprehension questions after strategies are shared. • *Who did it exactly the same way as ___? ("raise your hand if…")* • *Can you do that? Is that legal?* • *Did everyone understand ____'s way?* • *Can someone explain ___'s strategy in your own words?* • *Who has another way of solving it?*	• Students make sense of each other's strategies • Students see multiple ways of mentally solving problems, make connections between different ways of solving problems • Students talk about their own and each other's thinking

Number Talks

5-15 minute structured classroom conversation around purposefully crafted computation problems that are solved mentally. Number Talks supports the development of students' procedural fluency from a conceptual understanding.

Roles of a Teacher During Number Talks

Facilitator:
Keeping the discussion focused on the important mathematics and helping students learn to structure their comments and wonderings during a number talk. This is essential to ensure that the conversation flows in a meaningful and natural matter. As a facilitator, you must guide the students to ponder and discuss examples that build upon your purposes. By posing such questions as "How does Joey's strategy connect to the ideas in Renee's strategy?" you are leading the conversations to build on meaningful mathematics.

Listener:
Working to truly listen to our students' thinking to understand what their natural intuitions are regarding numbers. Emphasis is on less teacher talk. Students learn that the teacher is in a place of objective listening. As a result, students persevere with their own thinking rather than expecting the teacher to save them.

Questioner:
Shifting from only being interested in finding out their final answers to a problem, to broadening our focus to learn *how* students arrive at an answer and *why*. Challenging our assumptions that we know all of the methods that students may be using, and using questions to support students sharing their thinking and *process*.

Learner:
Having a deep sense of curiosity and openness to the variety of strategies and explanations that students offer during a number talk. Being open to the very real possibility that you will leave the number talk with a way of solving a problem you hadn't considered before.

Addition

Counting All/Counting On

Question: 8+3

Sample Solution:

For counting all the students would combine 8 and 3 by counting the set (1 ,2, 3, 4, 5, 6, 7, 8….9, 10, 11)

For counting on the student could say "8….9, 10, 11"

Breaking Up Into Place Value

Question: 45 + 23

Sample Solution:

45 + 23

(40 + 5) (20 + 3)

60 + 8

68

Making Tens

Question: 9+4

Sample Solution:
Student could say "I decomposed the 4 (3 and 1) and gave one to the 9 to make a ten and added the remaining 3.

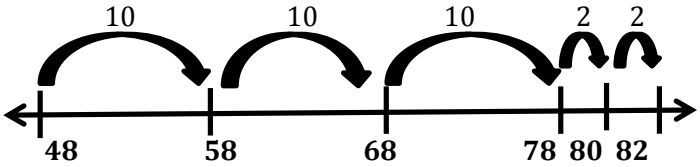
9+4 = 10+3

Adding Up In Chunks

Question: 48+34

Sample Solution: 48+34

48 + (10 + 10 + 10 + 4)



Doubles/Near Doubles

Question: 8+7 (when students use their double facts to solve related problems)

Sample Solution:

8+7 = 7+7+1
8+7 = 8+8-1

Compensation

Question: 39 +57

Sample Solution:
39 + 57
+1 -1
40 + 56= 96

Compensation: removing one quantity from one addend and adding it to the other addend. Although quantities are manipulated the total sum remains the same.

Landmark/Friendly Numbers

Question: 48+34

Sample Solution: 48 + 34

48 + (2 + 32)

50 + 32

82

Adjusting 1 Number To Create An Easier Number

Question: 39 + 24

Sample Solution:

Adding one to 39 to make it a 40

(39 (+1)) + 24

(40) + 24

64 (-1) = 63

Added 1 to 39 so 1 was removed from the sum

These strategies should be discovered, explored, and modeled by the students

Subtraction

Counting Back

Question: 8-3

Sample Solution:

For counting back students would start at 8 and count backward 3 until they arrived at 5.

8….7, 6, 5

Removal in Parts

Question: 45 - 23

Sample Solution:

45 - 23 (decompose 23)

(45 - 20) + 3 (separate 20 from 45)

25 - 3

22

Constant Difference

Question: 57-22

Sample Solution:
Add 3 to each number and the difference remains the same. Only the numbers become friendlier to work with.

57 - 22
+3 +3 (add 3 to each # keeps difference the same)
60 - 25

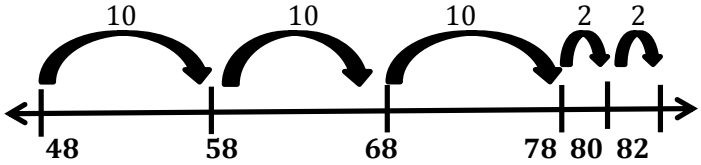
60-25=35

Adding Up to find the Difference

Question: 82-48

Sample Solution: 82-48

48 + (10 + 10 + 10 + 4)= 82



Student adds up from 48 to 82 to find the difference of 34.

Part Whole Box Model

Question: 57-22

Sample Solution:

Whole 57	
Part 22	Part 35

Students understand the whole and one part of the whole. Because of this, the student is able to identify the other missing part of the whole.

Adjusting 1 Number To Create An Easier Number

Question: 39 - 24

Sample Solution:

Adding one to 39 to make it a 40

(39 (+1)) - 24

(40)- 24 =16

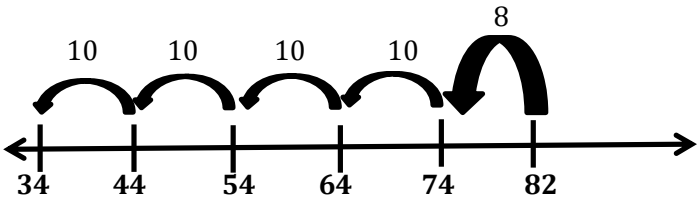
16 (-1) = 15

Added 1 to 39 so 1 was removed from the difference

Using a Number Line

Question: 82-48

Sample Solution: 82-48



Student counts back from 82 to find the difference

These strategies should be discovered, explored, and modeled by the students

Multiplication

Making Landmark or Friendly Numbers

Question: 9 x 29

Sample Solutions:

9 x 30 = 270 "that's one group of 9 too much, so. . ."
270 – 9 = 261
Or
9 x 25 = 225 "because 8 25's is 200, so 1 more 25 is 225"
9 x 2 = 18
9 x 2 = 18 and 18 + 18 = 36. 225 + 36 = 261

Partial Products

Question: 4 x 115

Sample Solution:

4 x 115 = 4 x 100 + 4 x 10 + 4 x 5

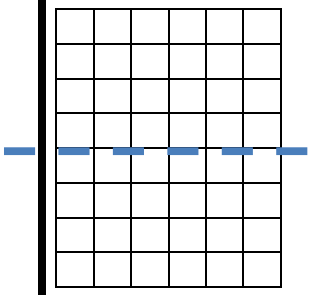
4 x 100 = 400
4 x 10 = 40
4 x 5 = 20
400 + 40 + 20 = 460

	100	10	5
4	4 x 100 = 400	4 x 10=40	4 x 5=20

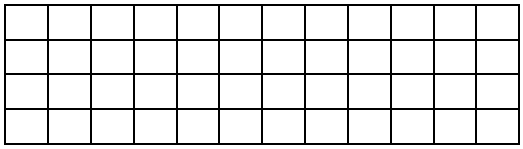
Doubling and Halving

Question: 8 x 6

Sample Solution: Doubling and Halving can help students relate facts that they are unsure of to facts with which they are fluent.



Cut the 8 x 6 array in half on the dotted line. Move the bottom section to the top right to make a 4 x 12 array. I know that's 48 because 4 x 10 = 40 and 4 x 2 = 8. 40 + 8 = 48



Breaking Factors into Smaller Factors

Question: 8 x 25

Sample Solution:

8 = 2 x 4
25 x 4 = 100
100 x 2 = 200, so 8 x 25 = 200

	25
4	4 x 25 = 100
4	4 x 25 = 100

These strategies should be discovered, explored, and modeled by the students

Division

Partial Quotients

Question: 550 ÷ 15

Sample Solutions:

```
15⟌550
   -150   10
    400
   -150   10
    250
   -150   10
    100
    -30    2
     70
    -30    2
     40
    -30    2
     10   36 r 10
```

```
15⟌550
   -300   20
    250
   -150   10
    100
    -75    5
     25
    -15    1
     10   36 r 10
```

```
15⟌550
   -450   30
    100
    -90    6
     10   36 r 10
```

Multiplying Up

Question: 550 ÷ 15

Sample Solution:

15 x 10 = 150
15 x 10 = 150
15 x 10 = 150 } 450

15 x 2 = 30] 480

15 x 2 = 30] 510

15 x 2 = 30] 540

15 x 36 = 540 + 10

550 ÷ 15 = 36 r 10

15 x 20 = 300
15 x 10 = 150
15 x 5 = 75

15 x 1 = 15
15 x 36 = 540

550 ÷ 15 = 36 r 10

15 x 30 = 450
15 x 6 = 90
15 x 36 = 540

550 ÷ 15 = 36 r 10

Number Talk Planning Tools

The following pages include two different blank templates for planning a Number Talk as part of a math lesson. The blank templates are followed by examples of completed templates for two different Number Talks, one for a primary class and one for a secondary class.

The lesson planning templates are intended to guide a teacher's thinking as s/he prepares to facilitate a Number Talk, including anticipating student responses, considering possible ways to scribe different strategies, and identifying questions that will elicit student thinking and prompt students to make sense of each others' ideas. Thinking through each of these steps is important as teachers build familiarity with the strategy.

Anticipating student responses is a particularly crucial step in preparing to facilitate a Number Talk. Because they are developing both their understanding of the mathematics and their ability to articulate their thinking, students will often share strategies that are difficult to understand, either because the reasoning is complicated or because their language is not precise, or both. This can be particularly true for younger students. Anticipating student responses before presenting the problem to the class, and giving thought to the kinds of strategies students might apply to the problem, helps to ensure that the teacher will be able to find the mathematical logic in any student's contribution. Asking questions that encourage students to elaborate, or having other students paraphrase, can also help to reveal more of a student's intention and support the student in articulating his/her thoughts.

Once Number Talks become a routine part of classroom practice with a group of students, the procedures for how students signal that they have an answer in mind, how the Number Talk is framed, and how answers are shared before strategies are discussed may become habits for both teacher and students and will require less formal planning. At that point, teacher planning can focus more narrowly on anticipating responses and identifying connections a teacher hopes students will recognize or specific strategies that a teacher hopes will surface through the discussion.

Number Talk Lesson Planning Template 1: Narrative

Grade Level: _____ **Unit:** _____

Core Math Idea:

Number Talk Problem:

Anticipated student methods and how to represent them:

<u>During the Lesson</u>

Frame for the activity: We are using a Number Talk to share different strategies for how we mentally approach a problem. Each person's role is to work on explaining their own thinking clearly, and to listen to other's explanations as well.

Maximum length of quiet time: _____

Silent signal when students are ready: _____

Process for sharing out:

-
-
-

Questions to orchestrate the class conversation about strategies:

Wrapping Up:

Number Talk Lesson Planning Template 2: Chart

Grade Level: **Unit:**

Core Math Idea:

Number Talk Problem	Possible Strategies & Method of Recording	Questions to Students
Follow up Problems (series)		**Wrap Up**
Academic Language		

Number Talk Lesson Plan 1: Elementary Sample

Grade Level: 3-5 **Unit:** Multiplication and Division

Core Math Idea: Students may be hindered in this unit because they are not yet fluent with basic addition and subtraction facts. So in this Number Talk, I will focus on adding and subtracting single and double digit numbers mentally, and specifically on the idea of **doubles plus/minus one.**

Number Talk Problem(s): 15 + 16 (First in a series, to be followed by 15 +14; 20 + 21; 22 + 23; 22 + 21

Anticipated student methods and how to represent them:

Standard algorithm (stack them in your head)	15 +16
Count on fingers:	15, 16, 17,... **31** (use open number line to represent single jumps)
Add 10 then add six	15 + 10 = 25 25 + 6 = 31
Double 15, then add one more:	15 + 15 = 30 30 + 1 = 31
Add 10 and 10, then add 5, then add 6	10 + 10 = 20 20 + 5 = 25 25 + 6 = 31

<u>During the Lesson</u>

Frame for the activity: We are using a Number Talk to share different strategies for how we mentally approach a problem. Each person should be ready to explain their process, and to listen to understand someone else's.

Maximum length of quiet time: 2 min

Silent signal when students are ready: Thumb up in front of your chest when you have an answer. Raise another finger for each different strategy you think of.

Process for sharing out:

- Talk to your partner about your strategy.
- Volunteers, what number did you get for your solution? (Record all responses)
- After sharing, poll the class – raise hand if you got this value

Questions to orchestrate the class conversation about strategies

- Who would like to share how they got their answer?
- I heard you say _____, did I hear correctly?
- Did anyone use a different method?
- Can someone explain _____'s strategy in their own words?
- Please raise your hand if you understand what _____just shared.

Wrapping Up: Questions I might ask:

- Can you find two strategies that are similar? How are they the same?

  Look at all of these strategies. Which new strategy would you want to try to use tomorrow

Number Talk Lesson Plan 2: Elementary Sample

Grade Level: 3-5 **Unit:** Multiplication and Division

Core Math Idea: Adding and subtracting single and double digit numbers mentally, and specifically the idea of ***doubles plus/minus one***.

Number Talk Problem	Possible Strategies & Method of Recording	Questions to Students
15 + 16	Standard algorithm (stack in your head): 15 +16 Count on fingers: 15, 16, 17,... 31 *(use open number line to represent single jumps)* Add 10 then add six: 15 + 10 = 25 25 + 5 = 31 Double 15, then add one more: 15 + 15 = 30 30 + 1 = 31 Add 10 and 10, then add 5, then add 6 10 + 10 = 20 20 + 5 = 25 25 + 6 = 31	• Who would like to share how they got their answer? • I heard you say _____, did I hear correctly? • Did anyone use a different method? • Can someone explain _____'s strategy in their own words? • Please raise your hand if you understand what ____ just shared.
Follow up Problems (series)		**Wrap Up**
15 + 14 20 + 21 22 + 23 22 + 21		Can you find two strategies that are similar? How are they the same? Look at all of these strategies. Which strategy would you want to try to use tomorrow?
Academic Language		
addend, sum, total, doubles, doubles plus one, doubles minus one		

Number Talks Lesson Plan

Grade Level: ___ **Unit:_____**

Core Math Idea:

Number Talk Problem (and follow up series)	**Possible Strategies and Method of Recording**	**Questions to Students**
		• Who would like to share how they got their answer? • I heard you say____, did I hear correctly? • Did anyone use a different method? • Can someone explain ____'s strategy in their own words? • Please raise your hand if you understand what ____ just shared. • Who would like to defend an answer?
Models and Tools		**Wrap Up**
		Can you find two strategies that are similar? How are they the same? Look at all of these strategies. Which strategy would you want to use tomorrow?
Academic Language		**Silent Signals**
		Hand at heart- thinking Thumb and fingers- strategies Agree signal Raised hand to share

Number Talks Lesson Plan

Grade Level: ___ **Unit:_____**

Core Math Idea:

Number Talk Problem (and follow up series)	Possible Strategies and Method of Recording	Questions to Students
		• Who would like to share how they got their answer? • I heard you say____, did I hear correctly? • Did anyone use a different method? • Can someone explain ____'s strategy in their own words? • Please raise your hand if you understand what ____ just shared. • Who would like to defend an answer?
Models and Tools		**Wrap Up**
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Number Talks Lesson Plan

Grade Level: ___ **Unit:_____**

Core Math Idea:

Number Talk Problem (and follow up series)	Possible Strategies and Method of Recording	Questions to Students
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Models and Tools		**Wrap Up**
		Can you find two strategies that are similar? How are they the same? Look at all of these strategies. Which strategy would you want to use tomorrow?
Academic Language		**Silent Signals**
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Number Talks Lesson Plan

Grade Level: ___ **Unit:_____**

Core Math Idea:

Number Talk Problem (and follow up series)	Possible Strategies and Method of Recording	Questions to Students
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Models and Tools		**Wrap Up**
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Number Talks Lesson Plan

Grade Level: ___ **Unit:_____**

Core Math Idea:

Number Talk Problem (and follow up series)	Possible Strategies and Method of Recording	Questions to Students
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Models and Tools		**Wrap Up**
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Number Talks Lesson Plan

Grade Level: ___ **Unit:_____**

Core Math Idea:

Number Talk Problem (and follow up series)	Possible Strategies and Method of Recording	Questions to Students
		• Who would like to share how they got their answer? • I heard you say____, did I hear correctly? • Did anyone use a different method? • Can someone explain ____'s strategy in their own words? • Please raise your hand if you understand what ____ just shared. • Who would like to defend an answer?
Models and Tools		**Wrap Up**
		Can you find two strategies that are similar? How are they the same? Look at all of these strategies. Which strategy would you want to use tomorrow?
Academic Language		**Silent Signals**
		Hand at heart- thinking Thumb and fingers- strategies Agree signal Raised hand to share

Can you find two strategies that are similar?

Turn and Talk to your partner about the similarities.

Take a look at all the strategies presented today…which one will you try tomorrow?

Were any of the strategies shared today confusing to you?

Talk to your partner about which ones and why they were confusing…

Whose strategy today was the most interesting to you and why?

Talk about this strategy with your partner…

Observer as Learner

Developed in the field by educators.

The primary "learner" in this protocol is the observer. The observer's only purpose is to learn how to improve his or her own practice. Since the observer has little responsibility to the observed, the duration of the observation and even the level of attention to what's going on is determined by the observer, as long as this is fine with the person being observed. Peer observation is never meant to be an evaluative process. The time involved may also be reduced if neither party desires a pre-observation conference.

Pre-Observation Conference
It is not necessary to have a pre-conference unless either party would like to have one. A pre-conference would help to orient the observer as to what will be happening.

Observation
The observer focuses on whatever she/he wishes.

Debrief
The observer often asks the observed questions that might help him or her better understand the choices made by the observed. The observer often shares an insight or other learning that occurred as a result of the observation, and thanks the observed teacher for sharing her practice.

Note: Given the potential feeling of vulnerability on the part of the observed in any situation, and especially in a situation such as this where the observed may have little idea of what the observer is focusing on, it's important that the observer try to ask questions during the debriefing in a way that does not put the observed on the defensive.

Number Talks- Observer As Learner- Peer Observations

Lesson:
Observation Date:
Observed:
Observer(s):

Pre-Observation Meeting Goals: (observers fill out)

Step 1: Observer communicates what they are hoping to learn from the Number Talk observations(s) (examples: student discourse, teacher talk moves, wait time, scribing student thinking, silent signals, academic vocabulary).
Step 2: Observed orients the observer as to what will be happening during the lesson (utilize the Number Talks lesson planning template).
Step 3: Identify *how* and *what* evidence is to be collected during observation. (ex: literal notes- student discourse, teacher talk moves, tallies for participation opportunities, etc).
Step 4: Agreements on interactions with students during observation
Step 5: Address any clarifying questions
Step 6: Prepare data collection form. Write down specific look-fors on form. (Teacher talk literal notes on blank sheet, look for question stems that open student thinking.)

Lesson:
Observation Date:
Observed:
Observer(s):

Observer as Learner-
POST Observation Meeting Goals:

Observer(s) ask clarifying questions of the observed to better understand the choices made by the observed

Observer shares any insights or other learning that occurred as a result of the observation.

(optional)
Observed has the opportunity to ask any specific probing questions about the evidence collected as related to their lesson.

1. *Observers give feedback only on what their partners have asked them to observe. Start with warm feedback- What went well? Use evidence collected to provide specific, detailed information on what was observed.*

2. *Suggestions should only be offered when asked by the observed*

3. *Be careful not to ask questions of the observed teacher that are thinly veiled criticisms. Any questions should be genuine- asking for information that will help the observer better understand what was observed.*

Reflection:

How will what I learned today impact my classroom instruction?
What will I do differently next time (as an observer *and* in my own instruction)?
What worked well today that I want to remember to do again (as an observer *and* in my own instruction)?
Instructional next steps: (materials, additional support, PD, resources needed, list out "to-do's")
What might we do differently next time that would improve the process and debriefing?