#NCTMannual @dh11235 Session #5

A Core Teaching Practice Establishing and Using Goals Effectively

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In the past!

Math
pp. 78, #1-30 odds

In the present!

Professional Learning Goals

We are learning to:

Better understand the characteristics and use of mathematics goals that strengthen the effectiveness of planning, teaching, and assessment for improving student learning.

Our Agenda

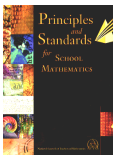
- Examine the NCTM core set of eight Effective Mathematics Teaching Practices
- Closer look at different types of math goals
- One school district's approach to raising the level of teacher ownership in clarifying goals
- Using math goals to focus learning
- Closing comments from students

Principles to Actions

25-year History of Standards-Based Mathematics Education Reform

1989 *Curriculum and Evaluation Standards for School Mathematics*

2000 *Principles and Standards for School Mathematics*

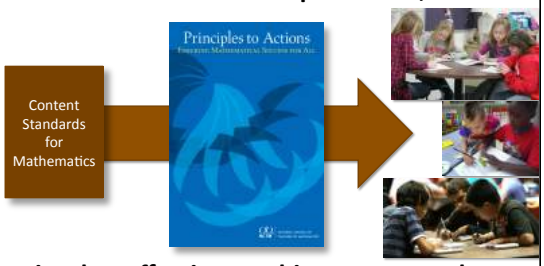


2010 *Common Core State Standards*

NCTM NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

nga CCSSO

Rigorous Standards define mathematics content expectations, but . . .



it takes effective teaching to ensure that students actually learn that mathematics.

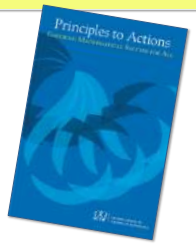
Overarching Message

Effective teaching is the non-negotiable core that ensures *all* students learn mathematics at high levels.

Principles to Actions (NCTM, 2014, p. 4)

NCTM's Core Set of Effective Mathematics Teaching Practices

A research-informed consensus on what constitutes effective teaching accumulated over the past 25 years.



Effective Mathematics Teaching Practices

1. Establish mathematics goals to focus learning.
2. Implement tasks that promote reasoning & problem solving.
3. Use and connect mathematical representations.
4. Facilitate meaningful mathematical discourse.
5. Pose purposeful questions.
6. Build procedural fluency from conceptual understanding.
7. Support productive struggle in learning mathematics.
8. Elicit and use evidence of student thinking.

Effective Mathematics Teaching Practices

Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.

Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.

Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.

Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.

Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.

Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

Handout

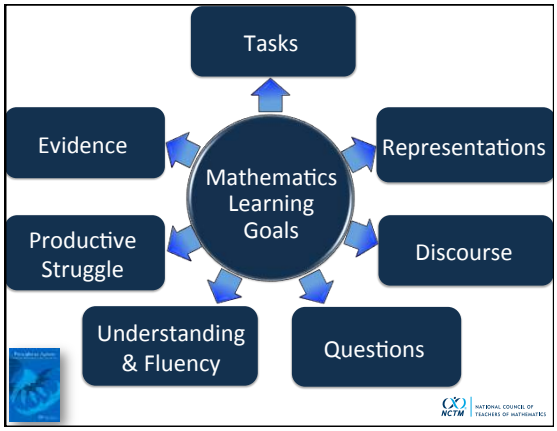
Read and underline important phrases.

Turn and share with a neighbor.

Two key messages about teaching!!

Formulating clear, explicit learning goals sets the stage for everything else.

(Hiebert, Morris, Berk, & Janssen, 2007, p. 51)



GOALS

The **learning goals** "derived from content standards, written in teacher language, and used to guide teaching during a lesson or across a series of lessons. They are not designed for students but for the teacher.

A **shared learning target**, on the other hand, frames the lesson from the students' point of view. A shared learning target helps students grasp the lesson's purpose—why it is crucial to learn this chunk of information, on this day, and in this way."

Connie Moss, Susan Brookhart, and Beverly Long (2011, p.66)

Moss, C. M., Brookhart, S. M., & Long, B. A. (2011). Knowing your learning target. *Educational Leadership*, *68*(6),

Examining Math Goal Statements

Examine Goal Statements A & B.

Discuss these questions with a shoulder partner:

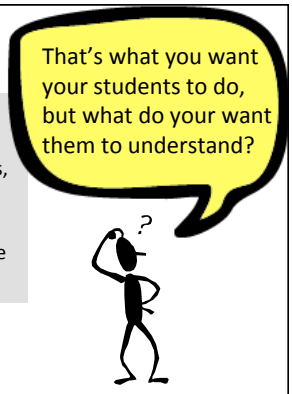
- How are the goals similar and different?
- What message does each goal send to students about learning mathematics?

Goal A: Students will learn to build rectangular arrays with tiles, find their length and width, and multiply the length and width to find the area of the rectangles.

Goal B: Students will learn that area is related to multiplication because area involves finding the number of square units that cover a rectangular array; length indicates the number of rows and the width tells the number of square units in each row.

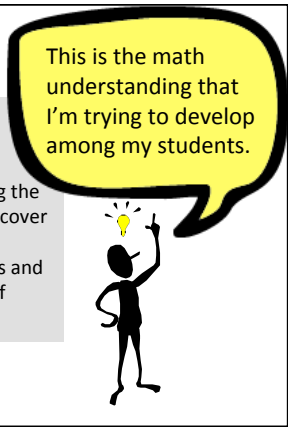
Performance Goal

Goal A
Students will learn to build rectangular arrays with tiles, find their length and width, and multiply the length and width to find the area of the rectangles.



Learning Goal

Goal B
Students will learn that area is related to multiplication because area involves finding the number of square units that cover a rectangular array; length indicates the number of rows and the width tells the number of square units in each row.



Learning Goal (Understanding)

Performance Goal (Actions)

From Small Groups, about 3-4 people.

Directions

- Set out the 2 cards labeled: Learning & Performance.
- Draw a Goal Statement card.
- Read the goal statement to your group.
- Discuss and determine whether it is a learning goal or a performance goal.

	Learning Goal	Performance Goal
Grade 3	Students will learn how comparing two fractions involves reasoning about their size and that two fractions can be compared only if they refer to the same whole.	Students will learn to compare fractions by finding common denominators.
Grade 6	Students will learn to explain that a ratio is a relationship between two quantities and be able to provide real-world examples of ratios.	Students will learn to plot pairs of values from a ratio table on the coordinate plane.

Why is it important to distinguish learning goals from performance goals?

What messages do the different types of goals send to students about the purpose of classroom learning?

Learning goals...

... understand about the math ideas, concepts, procedures, reasoning, relationships, and connections.

What students should understand about the topic?

Performance goals...

... produce, make, build, draw, say, explain, write, compute, graph, plot, or solve.

What students should be able to do?

(often with no mention of related understanding)

Students who perceive an emphasis on **learning goals** in the classroom use more effective strategies, prefer challenging tasks, persist in face of difficulties, are more positive attitude toward the class, and have a stronger belief that success follows from one's effort (growth mindset).

Students who perceived **performance goals** as salient in the classroom often seek the easiest and quickest way to achieve the goals, give up in the face of challenge, and tend to attribute failure to lack of ability (fixed mindset).

Ames & Archer (1988); Elliot & Dweck (1988); Grant & Dweck (2003)

Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Students' learning strategies and motivation processes. *Journal of educational psychology*, *80*(3), 260.
Elliott, E. S., & Dweck, C. S. (1988). Goals: an approach to motivation and achievement. *Journal of personality and social psychology*, *54*(1), 5.
Grant, H., & Dweck, C. S. (2003). Clarifying achievement goals and their impact. *Journal of personality and social psychology*, *85*(3), 541.

A District's Approach

Raising the level of teacher ownership in clarifying goals

How do teachers decide on the specific math learning goals for their lessons?

A. I just look at what's listed in my textbook.

B. The goals are all listed in the district pacing guide.

C. We just use the state standards.

D. I list the important math ideas I want my students to learn in each unit; then identify specific goals for lesson sequences.

E. My grade level team discusses the goals for upcoming lessons and we help each other clarify what we want our students to understand and how we will support differentiated learning.

How do teachers decide on the specific math learning goals for their lessons?

Low level of teacher ownership	High level of teacher ownership
Limited attention to the learning needs of students	Strong attention to the learning needs of students

The goals that guide instruction, however, should not be just a reiteration of a standard statement or cluster but should be more specifically linked to the current classroom curriculum and student learning needs, referring, for example, to particular visual representations or mathematical concepts and methods that students will come to understand as a result of instruction.

Principles to Actions (NCTM, 2014, p. 12)

SCHOOL DISTRICT OF CUDAHY

Grade Level Curriculum Meetings

Teachers at grade level:

- Give students a standards-based district pre-assessment.
- Sort work into 4 levels of understanding.

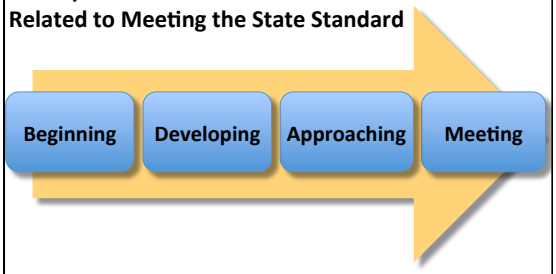
Teachers and Math Coach meet to:

- Unpack the standard by relating it to the assessment.
- Set learning targets based on needs of their students.
- Identify & articulate expectations for meeting standard.
- Examine samples of work at each level of understanding.
- Discuss ways to differentiate instruction to support students in progressing to the next level.

Student Pre-Assessment 4.NF.3

Check all the equations that are true: 5/6 is equal to: _____ a. 1/6 + 1/6 + 1/6 + 1/6 + 1/6 _____ b. 1 – 1/6 _____ c. 3/6 – 1/6 – 2/6 _____ d. 1 – 5/6 _____ e. 3/6 + 1/6 + 1/6	Decompose (break apart) 7/8 in two different ways using an equation and a visual model.
Five friends ordered 3 large sandwiches. James ate 3/4 of a sandwich. Katie ate 1/4 of a sandwich. Ramon ate 3/4 of a sandwich. Sienna ate 2/4 of a sandwich. How much sandwich is left for Oscar?	Emily, Kim, and McKenzie made a pan of brownies. Emily ate 1/8 and Kim and McKenzie each ate 2/8 of the pan of the brownies. Draw a visual model to show each person's share.

Description of Student Performance Related to Meeting the State Standard



State Standard Assessed: 4.NF.3

Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$.

a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.

c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

Learning Targets

I can understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

I can decompose fractions into a sum of fractions with the same denominator to show that I understand different ways to break apart fractions.

I can add and subtract mixed numbers with like denominators to show that I understand how to compose and decompose whole numbers and fractions.

Identify and Articulate Expectations for Students "Meeting the Standard"

- Student should be able to show their understanding of combining or decomposing fractions with like denominators with support of a visual model in given problems of either bare numbers or word problems.
- If a student is using physical model to be successful he/she would be approaching standard since standard states "with a visual fraction model."

Effective mathematics teaching begins with a shared understanding among teachers of the mathematics that students are learning and how this mathematics develops along learning progressions.

Principles to Actions (NCTM, 2014, p. 12)

Using Math Goals to Focus Learning

Teachers being clear on the goal of the learning as it relates to mathematical understanding

Goal as communicated to students

Goal as used by teachers and students during instruction

To Post or Not to Post Math Learning Targets in the Classroom

The mathematical purpose of a lesson should not be a mystery to students.

Classrooms in which students understand the learning expectations for their work perform at higher levels than classrooms where the expectations are unclear (Haystead & Marzano 2009; Hattie 2009).

Principles to Actions (NCTM, 2014, p. 13)

Hattie, J. A. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to Achievement*. NY: Routledge.

Haystead, M. W., & Marzano, R. J. (2009). *Meta-analytic synthesis of studies conducted at Marzano Research*

I recently asked a group of teachers: How do you...

- Decide on the math learning goals for your lesson?
- Communicate the purpose of a lesson to your students?
- Use learning goals during instruction?
- Determine if your students are making progress toward the intended learning goals?

All but one teacher post math learning targets.
All teachers discuss them at the beginning of the lesson.

I post the goals every day on the board and also have them at the beginning of all of my smart-board slides. We go over the goals at the beginning of the hour right after warm-ups. [Gr 6]

I project the learning goals at the beginning of a lesson and we discuss them to clarify any vocabulary. However, I hardly ever make reference to them during a lesson. [Gr 6]

Last year, I only had the learning goal on my slides for the day, now I also post them in the room on the board. This has really helped my students stay more focused; they even refer to them during the lesson. Having them posted has also been a good reminder to myself. [Gr 2]

(n=25 teachers)

When teachers refer to the goals during instruction, students become more focused and better able to perform self-assessment and monitor their own learning.

(Clarke, Timperley, & Hattie 2004; Zimmerman 2001)

Principles to Actions (NCTM, 2014, p. 13)

All the teachers revisit or try to revisit the math learning targets at the end and many use exit slips.

We then bring them back at the end to discuss how our work that day connected to the goals... I usually give students an exit slip that has a problem to apply the learning goals. Students know they can also put questions on the exit slip for me. [Gr 5]

At the end of the period, I usually ask students, "What stuck with you today?" Students answer on a post-it note and stick it on the classroom door before they leave. [Gr 6]

At the end of a lesson, I often ask students to talk with each other and tell what they have learned and whether they have met the target. Students then fill out exit tickets to show their progress in meeting the goals. [Gr 2]

(n=25 teachers)

A clear grasp of the mathematics frames the decisions that teachers make as they plan mathematics lessons, make adjustments during instruction, and reflect after instruction on the progress that students are making toward the goals.

(Hiebert, Morris, Berk, & Janssen, 2007)

Principles to Actions (NCTM, 2014, p. 13)

Closing Comments

"Revisiting our Learning Goal"

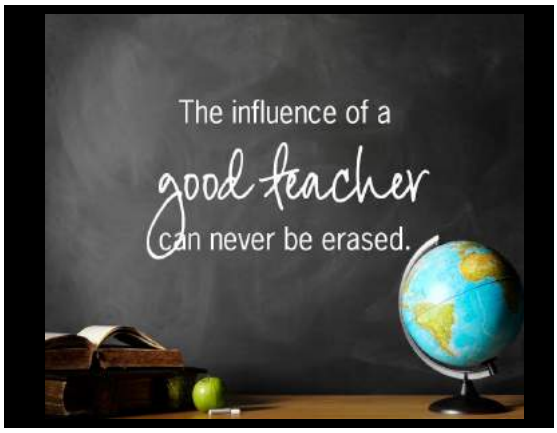
Professional Learning Goals

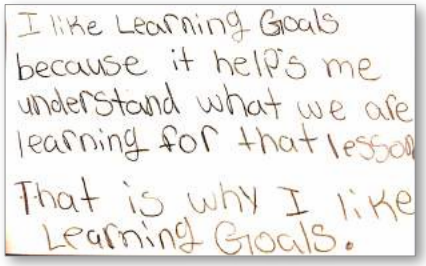
We are learning to:

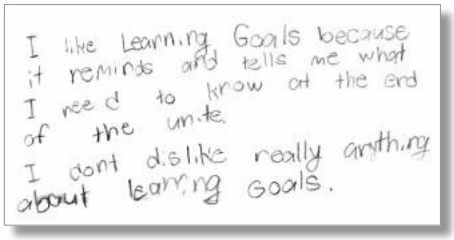
Better understand the characteristics and use of mathematics goals that strengthen the effectiveness of planning, teaching, and assessment for improving student learning.

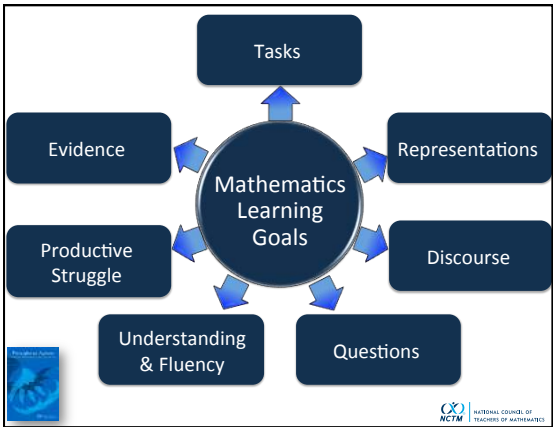
Walk Away Messages

- Districts should support teacher ownership in collaboratively clarifying learning goals and establishing goals targeted to student learning needs.
- Teachers need to more strongly communicate the goal of the learning to students, not just the expected performance.
- Math goals focused on understanding mathematics send important and valuable messages to students about what it means to be successful in mathematics.









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Thank You!

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Handouts and Slides
https://nctm.confex.com/nctm/2016AM/webprogram