The Cognitive Classroom

Presented by
Susan Tate and Julie Yearsley
At First... CGI Friday

if you don't know where you want to go, it doesn't matter which path you take.

Lewis Carroll 1865
Making CGI work in YOUR Classroom

“Our goal is not to provide models of classroom instruction to serve as a template for you to apply to your own classroom. Rather, we present specific cases that embody first principles of successful CGI classrooms. Our goal is for teachers individually and in collaboration with other teachers to make sense of the principles in relation to their own classes and teaching styles.” Children’s Mathematics page xix
What does Cognitively Guided Instruction (CGI) Look Like?

Downey Unified’s Mission Statement

- Problem solving is the focus of instruction; teachers pose a variety of problems

- Many problem-solving strategies are used to solve problems. Children decide how they should solve each problem.

- Children communicate to their teachers and peers how they solve the problems.

- Teachers understand children’s problem-solving strategies and use that knowledge to plan instruction.
# Levels of Classroom Discourse

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<th>Questioning</th>
<th>Explaining Mathematical Thinking</th>
<th>Mathematical Representations</th>
<th>Building Student Responsibility Within the Community</th>
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<tr>
<td><strong>Level 0</strong></td>
<td>Teacher is only questioner. Questions serve to keep students listening to teacher. Students give short answers and respond to teacher only.</td>
<td>Teacher questions focus on correctness. Students provide short answer-focused responses. Teacher may give answers.</td>
<td>Representations are missing, or teacher shows them to students.</td>
<td>Culture supports students keeping ideas to themselves or just providing answers when asked.</td>
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<td><strong>Level 1</strong></td>
<td>Teacher encourages the sharing of math ideas and directs speaker to talk to the class, not to the teacher only.</td>
<td>Teacher questions begin to focus on student thinking and less on answers. Only teacher asks questions.</td>
<td>Teacher probes student thinking somewhat. One or two strategies may be elicited. Teacher may fill in an explanation. Students provide brief descriptions of their thinking in response to teacher probing.</td>
<td>Students learn to create math drawings to depict their mathematical thinking.</td>
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<td><strong>Level 2</strong></td>
<td>Teacher facilitates conversation between students, and encourages students to ask questions of one another.</td>
<td>Teacher asks probing questions and facilitates some student-to-student talk. Students ask questions of one another with prompting from teacher.</td>
<td>Teacher probes more deeply to learn about student thinking. Teacher elicits multiple strategies. Students respond to teacher probing and volunteer their thinking. Students begin to defend their answers.</td>
<td>Students label their math drawings so that others are able to follow their mathematical thinking.</td>
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<td><strong>Level 3</strong></td>
<td>Students carry the conversation themselves. Teacher only guides from the periphery of the conversation. Teacher waits for students to clarify thinking of others.</td>
<td>Student-to-student talk is student initiated. Students ask questions and listen to responses. Many questions ask “why” and call for justification. Teacher questions may still guide discourse.</td>
<td>Teacher follows student explanations closely. Teacher asks student to contrast strategies. Students defend and justify their answers with little prompting from the teacher.</td>
<td>Students follow and help shape the descriptions of others’ math thinking through math drawings and may suggest edits in others’ math drawings.</td>
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How to get where you’re going!

What...
CCSS

Why...
CGI

How...
SMPs


cgi = Cognitively Guided Instruction
Thomas Carpenter and Elizabeth Fennema defined different problem types. “If we want to give children the opportunity to build their understanding from within, we need to understand how children think about math.”
-Carpenter, et. al. (1999)
## Know Your Standards

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<th>Routines and Activities</th>
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<td>number to represent the problem.</td>
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<td>1.OA.3: Apply properties of operations as strategies to add and</td>
<td>Commutative property of addition</td>
<td>number talk</td>
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<td>subtract. Examples: if (8 + 3 = 11) is known, then (3 + 8 = 11)</td>
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<td># of the day</td>
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<td></td>
<td>Quick images dot cards</td>
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<td>the second two numbers can be added to make a ten, so (2 + 6 + 4 = 2 +</td>
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<td>ten frame cards</td>
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<td>10 = 12. (Associative property of addition.)</td>
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<td>t/f number sentences</td>
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<td>1.OA.4: Understand subtraction as an unknown-addend problem. For example</td>
<td>related facts minus as a plus</td>
<td>word problems-strategy</td>
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<td>subtract (10 - 8) by finding the number that makes 10 when added to</td>
<td></td>
<td>number talk</td>
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<tr>
<td>8.</td>
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Getting it all in!

Remember: “There is no optimal way to organize a CGI class.” Children’s Mathematics, page 77

- K-2 Number of the Day-3 Factors 4-5 Protractor
- BRASSY
- Routines
- MWF New Word Problem
- TTH Revisit yesterday’s Word Problem and Counting Collections
- Games
Number of the Day

K-2 We Count the days of school or pick a number

10-15 minutes each day
Number of the Day

82

- 82 + 0 = 82
- 0 + 82 = 82
- 84 - 2 = 82
- Even
- 840 ÷ 2 = 420
- Expanded Form
- 80 ÷ 2 = 40
- Tyler's Birthday
- Pizza Day!

- 20 + 10 + 30 + 10 + 12
- 20 + 20 + 20 + 20 + 2
- (20 x 4) + 2
- (40 x 2) + 2
- (5 x 16) + 2
- 100 - 100 + 82
- (16 x 5) + 2 = 82
- 81 + 1 = 82
Protractor
Number of the Day in Action
Look at the Math!

Number of the Day 112

tally marks
ten frames
ten frames with 10s in the box instead of dots
112 + 0
0 + 112
one hundred twelve
(10)² + 12
(10)² + 6 + 6
100 + 12
10 x 10 + 12
30 + 70 + 12
70 + 30 + 12
10 + 10 + 10 + 20 + 20 + 20 + 20 + 2
even
(25 x 4) + 12
28 x 4
(10 x 10) + 12
1 + 1 + 1 + 1 + 1 + 1 all the way to 112
82 + 30
(30 x 2) + 12
(400 ÷ 4) + 12
200 - 80 - 8
113 - 1
112 + 0
200 + 200 - 300 + 12
50 + 50 + 10 + 2
108 + 4
120 - 8

Number of the Day 112

(10 x 10) + (6 x 2)
784 ÷ 7
16 1/2 - 900
224 ÷ 2
(25 x 4) + (4 x 8)
(50 x 2) + (5 x 2) + (1 x 2)
10 x 112
(50 x 8) - 88
120 ÷ 10
768 ÷ 84
(8 x 8) + 10
(7 x 10) + (7 x 6)
(11 x 10) + 2
1008 ÷ 9
14,886 + 128
62 + 48
1,120 - 1,008
(21 x 2) + 70
266 - 144
56 x 2
(10 x 10) + 12
800 - 198
(50 x 4) - 88
(20 x 8) + (2 x 5) + (8 x 10) + 12
22,400 ÷ 200
999 - 887

Number of the Day 112

10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 2
even
(10 x 11) + 2
tally marks
(5 x 22) + 2
ten frames
50 + 50 + 12
111 + 1
113 - 1
112 + 0
0 + 112
50 + 50 + 12
448 ÷ 4
336 ÷ 3
224 ÷ 2
100 + 12
20 + 80 + 12
one hundred twelve
112 + 112 - 112
counting by 4s
110 + 2
120 - 8
20 + 20 + 20 + 20 + 20 + 12
200 - 100 + 12
ten more 122 ten less 102
110 + 2
109 + 3
108 + 4
Number of the Day/Protractor in the Cognitive Classroom

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- Many problem-solving strategies are used to solve problems. Children decide how they should solve each problem.

- Children communicate to their teachers and peers how they solve the problems.

- Teachers understand children’s problem-solving strategies and use that knowledge to plan instruction.
“Wait a minute! Why’d PJ get 4 sandwiches and I only got 2?”
BRASSY
3-5 minutes each day

Cover the additional and supporting standards everyday for 5 minutes
*Could focus on one domain per week in each month

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<th>Day of the Week</th>
<th>Standards to focus on for 3 to 5 minutes DAILY</th>
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<td>Monday MD.4</td>
<td>Data Dump Day: Students collect the data that will be used to make a graph. EX. choose pepperoni or cheese pizza. Use a Post it on a piece of construction paper labeled.</td>
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<td>Tuesday MD.4</td>
<td>Data Discovery: Make some type of graph using Data Dump Information. Discuss the graph. Find how many more etc.*</td>
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<td>Wednesday MD.1 &amp; MD.2</td>
<td>Measurement: Using a non-standard unit, measure things in the classroom. Compare lengths of things. EX. An eraser to a crayon, a crayon to a pencil, then without showing them together, an eraser to a pencil.</td>
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<td>Thursday MD.3 &amp; MD.3.1</td>
<td>Time: Use a clock to teach and practice time to the hour and the half hour. Relate time to events (before/after, shorter/longer).</td>
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<td>Friday G.1, G.2, G.3 &amp; MD.4.1</td>
<td>Geometry: Expose the 2D and 3D shapes. Distinguish between defining and non-defining attributes. Make new shapes using these shapes. Make circles and rectangles into halves and fourths. Describe, extend, and explain patterns.</td>
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*This data can be used for one of the class' word problems this week. Works well for how many more or fewer.
** This is just a suggested order. Use an order that works best for your class.

First Grade BRASSY Time
Basic Readiness 4
Additional & Supporting Standards Yearlong

BRASSY time is 3 to 5 minutes every day that you specifically teach the Measurement and Geometry Standards. Only MD 1 is an essential standard. The rest are supportive or additional, which means they are necessary, but are not the bulk of your program. A unit does not need to be done to cover these standards. Exposure over time will be helpful to retain this information. Choose one section to cover each week. EX. For geometry, work on the halves only. Then the next week do fourths, etc. To assess, use ticket out, put them in a center, and/or formal assessment. These standards are fun! *The 2D and 3D shapes can be reviewed daily with the calendar (if you want).
BRASSY

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Routines
10-15 minutes each day

- Build Number Sense
- Make connections
- Cover standards including SMPs
- Clear up misconceptions
These are a Few of Our Favorite Routines...

- Queen of TEN, 5 Fairy, & 20 is Plenty
- Choral Counting
- True/False
- Dot Cards
- Hundred Chart
- Guess My Number
- 3 of These Things
- Number Strings
- Open Expressions

A lot more - this book is great!

Jessica F. Shumway

NUMBER SENSE ROUTINES

Building Numerical Literacy Every Day in Grades K–3

Foreword by Lucy West
Routines
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New Word Problem

35-40 Minutes
MWF

“The formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill.”
Albert Einstein
Open Strategy Sharing
Word Problem

MWF 35-45 minutes

• Read problem together
• Unpack
• Have a go/monitoring
• What did they do/share out
Word Problems

Share Out
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Tuesday and Thursday
Targeted Discussion
Revisit Yesterday’s Word Problem

- Compare and Connect
- Why? Let’s Justify
- What’s Best and Why?
- Define and Clarify
- Troubleshoot and Revise
What's Best and Why?
Counting Collections

35-40 minutes 2 times a week

- The place value standards can be taught through counting collections.
Counting Collections in Action!
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Games

- 5-8 Minutes when there is time!
- Fact Fluency (FEA) Levi/Jaslow
- Cards- Making 10, greater than less than, Number Top-It, Addition or Fraction Top-It
- Dominoes
Games
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CGI Rocks - All the Standards can be covered without a textbook!

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Conference Questions

1. In what ways are your students allowed to bring “their whole selves” to the learning of mathematics in your classroom and school?

2. What do you know about the cultural and lived experiences of the students in your mathematics classroom? (How can you broaden your knowledge?)

3. How does your mathematics classroom interrupt and/or reinforce narratives of who is and who is not capable mathematically? (How could your classroom become more interruptive vs. reinforcing of these narratives?)
Jump in!

- Susan Tate state@dusd.net
- Julie Yearsley jyearsley@dusd.net
- Downey Unified School District’s Website