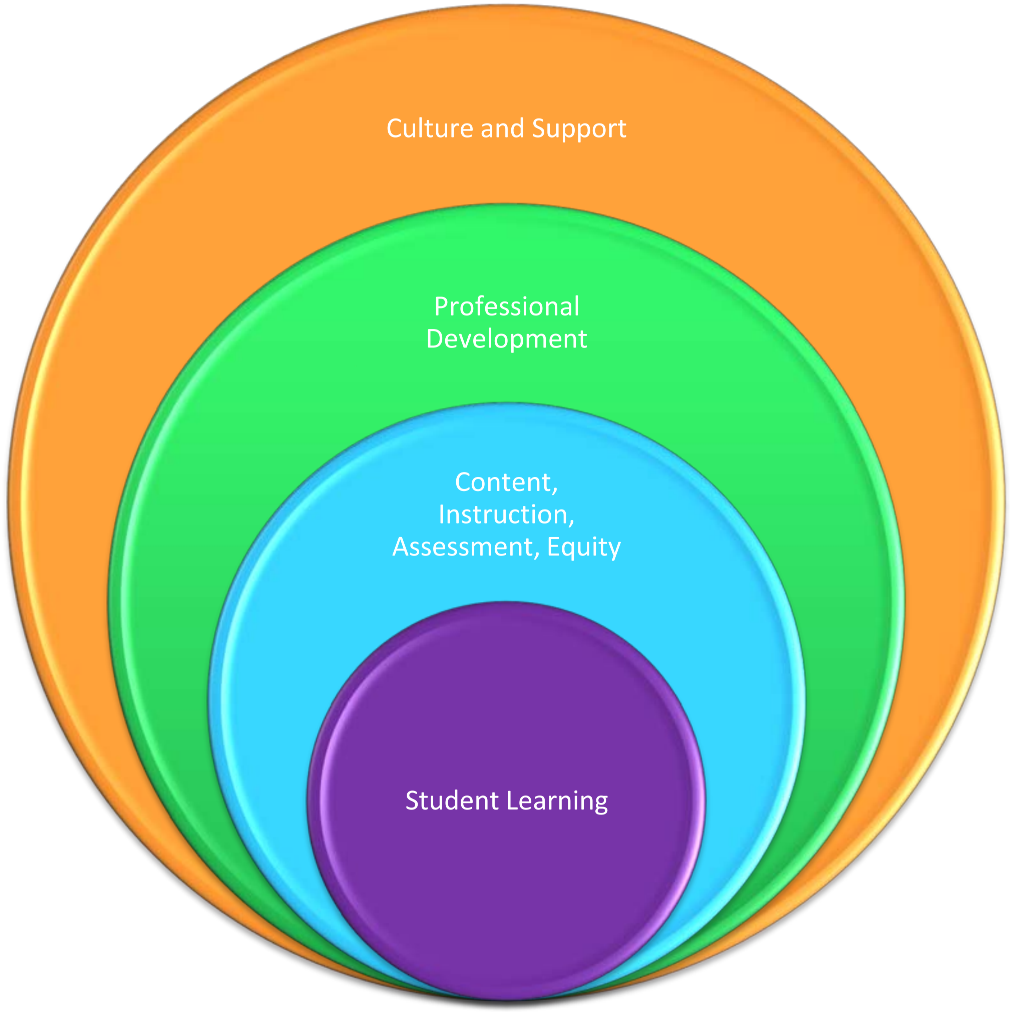
Culture and Support
Professional Development
Content, Instruction, Assessment, Equity
Student Learning

**Mining Professional Wisdom and Expertise**
**Protocol Developed by**
**Dr. Janice Bradley**

Math teachers shared their thinking about this question:

*What is needed in this school now to strengthen learning experiences for mathematics students?*

The words and categories reflect collective thoughts from the teachers.

Overarching question**: How do we enhance student learning?**

| Curriculum | Collaboration | Student Needs | Coach Role | Data |
|---|---|---|---|---|
| • Identify important math connections in NMSB<br>• Organize curriculum to reflect vertical alignment<br>• Look at upcoming units and plan connections | • Meet as a PLC<br>• Listen to others' ideas<br>• Meet regularly (weekly) in horizontal meetings<br>• Work together as a team<br>• Identify common and main goal<br>• Ask "What's working for students? Where do we want students to be?"<br>• Establish a relaxed, fun working atmosphere<br>• Need time to talk together and discuss | • Talk about and identify effective remediation<br>• Clarify "hands-on" learning – purpose, when, how, with what<br>• Relevancy – students need to see practical applications for their math learning in classrooms<br>• Resources – build over time (technology, calculators, batteries, etc.) | • Team teach, co-teach lessons<br>• Identify math in upcoming unit<br>• Share instructional strategies that work | • Record data from classroom learning<br>• Ask coach to analyze data sources and share with teachers |

| **Teacher** | *What is needed in this school now to strengthen learning experiences for mathematics students?* |
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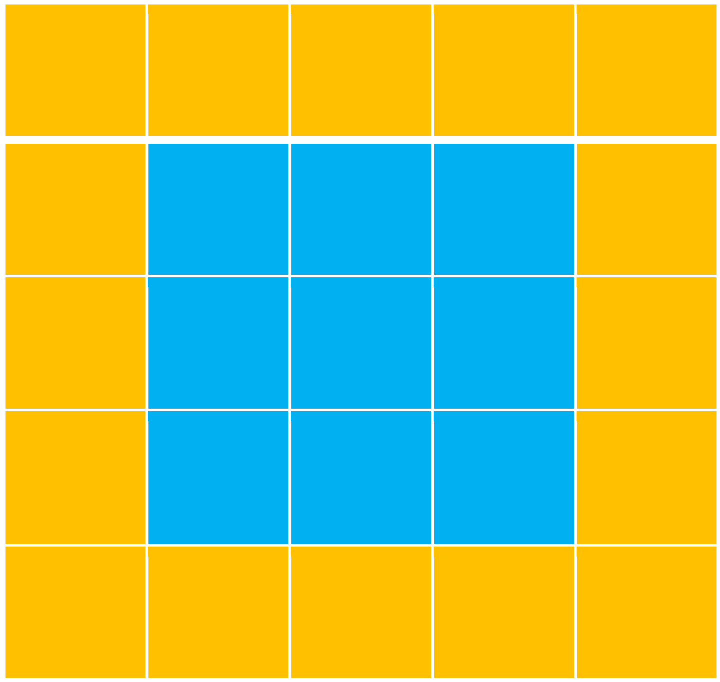
# The Border Problem



- Without counting every tile, how can you determine how many colored square tiles are needed for a border around the square? Find two strategies, other than counting, for finding the number of border tiles. Describe each of your two strategies **in words**.

- For each of your strategies, write an equation for the number of "*N*" border tiles needed for a square of side length "s."

# TASK ANALYSIS GUIDE

<table>
<tr><th>LOWER-LEVEL DEMANDS</th><th>HIGHER-LEVEL DEMANDS</th></tr>
<tr><td>Memorization Tasks<br>• Involve either reproducing previously learned facts, rules, formulae, or definitions OR committing facts, rules, formulae, or definitions to memory.<br>• Cannot be solved using procedures because a procedure does not exist or because the time frame in which the task is being completed is too short to use a procedure.<br>• Are not ambiguous—such tasks involve exact reproduction of previously seen material and what is to be reproduced is clearly and directly stated.<br>• Have no connection to the concepts or meaning that underlie the facts, rules, formulae, or definitions being learned or reproduced.</td><td>Procedures With Connections Tasks<br>• Focus students' attention on the use of procedures for the purpose of developing deeper levels of understanding of mathematical concepts and ideas.<br>• Suggest pathways to follow (explicitly or implicitly) that are broad general procedures that have close connections to underlying conceptual ideas as opposed to narrow algorithms that are opaque with respect to underlying concepts.<br>• Usually are presented in multiple ways (e.g., visual diagrams, manipulatives, symbols, problem situations). Making connections among multiple representations helps to develop meaning.<br>• Require some degree of cognitive effort. Although general procedures may be followed, they cannot be followed mindlessly. Students need to engage with the conceptual ideas that underlie the procedures in order to successfully complete the task and develop misunderstanding.</td></tr>
<tr><td>Procedures Without Connections Tasks<br>• Are algorithmic. Use of the procedure is either specifically called for or its use is evident based on prior instruction, experience, or placement of the task.<br>• Require limited cognitive demand for successful completion. There is little ambiguity about what needs to be done and how to do it.<br>• Have no connection to the concepts or meaning that underlie the procedure being used.<br>• Are focused on producing correct answers rather than developing mathematical understanding.<br>• Require no explanations or explanations that focus solely on describing the procedures that were used.</td><td>Doing Mathematics Tasks<br>• Requires complex and nonalgorithmic thinking (i.e., there is not a predictable, well-rehearsed approach or pathway explicitly suggested by the task, task instructions, or a worked-out example).<br>• Require students to explore and understand the nature of mathematical concepts, processes, or relationships.<br>• Demand self-monitoring or self-regulation of one's own cognitive processes.<br>• Require students to access relevant knowledge and experiences and make appropriate use of them in working through the task.<br>• Require students to analyze the task and actively examine task constraints that may limit possible solution strategies and solutions.<br>• Require considerable cognitive effort and may involve some level of anxiety for the students due to the unpredictable nature of the solution process required.</td></tr>
</table>

*Source:* Reprinted by permission of the Publisher. From Mary Kay Stein, Margaret Schwan Smith, Marjorie A. Henningsen, Edward A. Silver, *Implementing Standards-Based Mathematics Instruction: A Casebook for Professional Development*, New York: Teachers College Press. 

# Cognitive Demand Focus Questions

What level of Cognitive Demand do you observe in the mathematics classes in your building?

When might it be appropriate to use a low-level demand task?  A high-level demand task?

How could you use the Cognitive Demand Task framework to assess the teaching and learning or mathematics at your site?

How could you use the Cognitive Demand Task framework to have conversations about ***student learning*** in mathematics at your site?

Adapted from *Secondary Lenses on Learning*
Corwin Press, 2009

**Figure 2.2a** Lower-Level Versus Higher-Level Approaches to the Task of Determining the Relationships Among Different Representations of Fractional Quantities (Stein & Smith, 1998)

## LOWER-LEVEL DEMANDS

**Memorization**

What are the decimal and percent equivalents for the fractions $\frac{1}{2}$ and $\frac{1}{4}$?

*Expected Student Response*

$\frac{1}{2} = .5 = 50\%$

$\frac{1}{4} = .25 = 25\%$

**Procedures Without Connections**

Convert the fraction to $\frac{3}{8}$ a decimal and a percent.

*Expected Student Response*

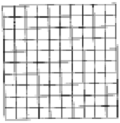
| Fraction | Decimal | Percent |
|---|---|---|
| $\frac{3}{8}$ | $8\overline{)3.000}$ = .375<br>24<br>60<br>56<br>40<br>40 | .375 = 37.5% |

## HIGHER-LEVEL DEMANDS

**Procedures With Connections**

Using a 10 × 10 grid, identify the decimal and percent equivalents of $\frac{3}{5}$.

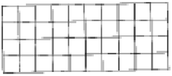
*Expected Student Response*

| Pictorial | Fraction | Decimal | Percent |
|---|---|---|---|
|  | $\frac{60}{100} = \frac{3}{5}$ | $\frac{60}{100} = .60$ | .60 = 60% |

**Doing Mathematics**

Shade 6 small squares in a 4 × 10 rectangle. Using the rectangle, explain how to determine each of the following: (a) the percent of area that is shaded, (b) the decimal part of area that is shaded, and (c) the fractional part of area that is shaded.

*One Possible Student Response*



(a) One column will be10% since there are 10 columns. So four squares is 10%. Then 2 squares is half a column and half of 10% which is 5%. So the 6 shaded blocks equal 10% plus 5% or 15%.

(b) One column will be .10 since there are 10 columns. The second column has only 2 squares shaded so that would be one half of .10 which is .05. So the 6 shaded blocks equal .1 plus .05 which equals .15.

(c) Six shaded squares out of 40 squares is $\frac{6}{40}$ which reduces to $\frac{3}{20}$.

Source: Reprinted with permission from *Mathematics Teaching in the Middle School*, copyright 1998 by the National Council of Teachers of Mathematics. 

**Focusing Grade Level Teams on**
**Improving Classroom Learning**

In a recent study [Saunders, Wm., Goldenberg, C. N., and Gallimore, R. (2009). *Increasing Achievement by Grade Level Teams on Improving Classroom Learning: A Prospective, Quasi-Experimental Study of Title I Schools*, published in the AERA Journal, December, Vol. 46, No. 4, pp. 1006-1033], when grade level teams used a specific protocol with fidelity 3 hours per month, and principals supported and monitored its use in Learning Teams, student achievement was of statistical and practical significance.

**Protocol Used By Grade Level Teams**

1. Identify and clarify specific and common student needs to work on together.
2. Formulate a clear objective for each common need and analyze related work.
3. Identify and adopt a promising instructional focus to address each common need.
4. Plan and complete necessary preparation to try the instructional focus in the classroom
5. Try the team's instructional focus in the classroom.
6. Analyze student work to see if the objective is being met and evaluate the instruction.
7. Reassess: continue and repeat cycle to move on to another area of need.

**Principal Actions**

1. Clearly communicates expectations for teachers to attend learning teams every other week, and use the protocol.
2. Creates a schedule to allow teachers to meet as a team.
3. Meets with the learning team facilitator either before or after the meeting to reflect and assess needs and address unique challenges.
4. Attends at least 4 learning team meetings and listens for how teachers are using the protocol.
5. Observes in every teachers' classroom at least twice to observe enacting the instruction focus, and gives immediate, reflective feedback.

*Shared by Dr. Janice Bradley*
*New Mexico State University*
*$MC^2$ and LIFT Project Coordinator*

MC$^2$ Mathematics Leadership Summer Academies

# Lenses on Learning Partners with MC$^2$ 2009

*What does quality math instruction look like?*
*When is a noisy math classroom a good thing?*
*How do you use teamwork to invigorate your schools' math instruction?*

***Lenses on Learning (LOL)***, a nationally-developed, research-based, piloted program specially designed for district leaders can help you positively answer these questions. This program has been instrumental in improving mathematics instruction / learning throughout the nation and in New Mexico.

"Lenses on Learning has been the single most important factor in our district's success in implementing a K-12 Standards-Based math initiative. The course presents a unique opportunity for administrators and teacher leaders to develop a common perspective and understanding. The experience set the stage for us to put in place a strong and unified team, committed to the full implementation of our program." **Mike Reese, Associate Superintendent, Moriarty School District, New Mexico.**

MC$^2$ is partnering with *Lenses on Learning* to provide you with this quality professional development for the purpose of improving student learning and achievement in mathematics.

**Learn to:**

- Support leadership for middle and high schools
- Raise expectations for student learning in mathematics
- Create pathways to success in Algebra
- Address inequitable student achievement in mathematics

**Schools are strongly advised** to include the following people in their teams:

- Middle or High School Principal
- Influential Mathematics Teachers/Department Chair
- Guidance Counselor
- District Curriculum Director

**Secondary *Lenses on Learning* will:**

- Guide teams in key areas of school practice which are known to have an impact on secondary students' mathematical learning.
- Develop the capacity of leaders in administrative and instructional roles to work together as a coherent mathematics leadership team in order to strategically advance the work of the mathematics program in their school.

The *Lenses on Learning* series is comprised of 6 cumulative sessions of 6 hours each. We will focus on the first 2 days in our summer academy and follow up with 4 single day sessions during the school year. The content of the sessions is as follows:

**Session 1 - Content:** What does it mean to know Algebra?
**Session 2 - Instruction:** What does high quality instruction look like?
**Session 3 - Formative Assessment:** How can assessment support learning and instruction?
**Session 4 - Equitable Practices:** How can we hold high expectations and provide strong support for *all students*?
**Session 5 - Professional Development**: How can professional development enable teachers to improve student achievement?
**Session 6 - Mathematics Improvement Process**: How can school leaders advance their mathematics program toward success for all?

**See you this summer!** **Register** **online at http://mc2.nmsu.edu**