OCDE Project GLAD® Strategies That Promote Learning Mathematical Language and Content


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Literacy Coordinator, ESD 105
Purpose

Increase understanding of how to use and modify OCDE Project GLAD® strategies to support students in learning mathematic language, practices and content based upon the principles for the design of mathematical curricula by Understanding Language/SCALE.
Who is in the room

If you are an OCDE Project GLAD® trainer please stand.
If you have completed OCDE Project GLAD training please stand.
If you have had some exposure to OCDE Project GLAD® training through colleagues please stand.
If you hearing about OCDE Project GLAD® for the first time please stand.
Why

How second language acquisition progresses
Academic language is one of the more important factors is academic success of ELs
Ensure equity of academic opportunities
How second language acquisition actually progresses

Previous ELL philosophy and programs aimed to “systematize” language instruction along a linear continuum
**Why**
Academic language is one of the more important factors in academic success of ELs
Ensure equity of academic opportunities

**How**
Designing learning opportunities that prompt language production with adequate supports.

**What**
Use research-based routines and strategies.
Making Connections

How can we adapt OCDE Project GLAD® strategies to adhere to the guidance set forth in this document?

UNDERSTANDING LANGUAGE/
STANFORD CENTER FOR ASSESSMENT,
LEARNING, AND EQUITY

Stanford University
Graduate School of Education

Principles for the Design of Mathematics Curricula:
Promoting Language and Content Development

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Renae Skarin
Steven Weiss
James Malamut

February 28, 2017
Version 2.0
1. Mathematical understanding and language competence develop interdependently.

2. Students are agents in their own mathematical and linguistic sense-making.

3. Scaffolding provides temporary supports that foster student autonomy.

4. Instruction supports learning when teachers respond to students' verbal and written work.

Shift in Understanding of Language Proficiency & Content Learning

Previously Framed as a Sequential Relationship

ELP standards and instruction provided a foundation from which to approach content standards

Now Framed as a Parallel Relationship

ELP standards and instruction reflect the language expectations contained in content standards

Source: WestEd
OUR FRAMEWORK

This framework includes **four design principles** for promoting mathematical language use and development in curriculum and instruction. The design principles and related routines work to make language development an integral part of planning and delivering instruction while guiding teachers to amplify the most important language that students are expected to bring to bear on the central mathematical ideas of each unit. The design principles, elaborated below, are:

Design Principle 1: Support sense-making  
Design Principle 2: Optimize output  
Design Principle 3: Cultivate conversation  
Design Principle 4: Maximize linguistic and cognitive meta-awareness

These four principles are intended as guides for curriculum development and planning and execution of instruction, including the structure and organization of interactive opportunities for students, and the observation, analysis, and reflection on student language and learning. The design principles motivate the use of **mathematical language routines**, described in detail below, with examples. The eight routines included in this document are:

MLR1: Stronger and Clearer Each Time  
MLR2: Collect and Display  
MLR3: Critique, Correct, and Clarify  
MLR4: Information Gap  
MLR5: Co-Craft Questions and Problems  
MLR6: Three Reads  
MLR7: Compare and Connect

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The Theory of Action

1. Support Sense-Making
2. Optimize Output
3. Cultivate Conversation
4. Maximize Meta-Awareness

4 Design Principles

• Mathematical understanding and language competence develop interdependently.
• Students are agents in their own mathematical and linguistic sense-making.
• Scaffolding provides temporary supports that foster student autonomy.
• Instruction supports learning when teachers respond to students’ verbal and written work.

8 Language Routines

MLR1. Stronger and Clearer Each Time
MLR2. Collect and Display
MLR3. Critique, Correct and Clarify
MLR4. Information Gap
MLR5. Co-Craft Questions and Problems
MLR6. Three Reads
MLR7. Compare and Connect
MLR8. Discussion Supports

16 Examples

(2 per Mathematical Language Routine)

Design Principles

Support Sense Making
- MLR2: Collect and Display
- MLR6: Three Reads
- MLR8: Discussion Supports

Optimize Output
- MLR1: Stronger and Clearer
- MLR3: Critique, Correct and Clarify
- MLR4: Info Gap
- MLR7: Compare and Connect

Cultivate Conversation
- MLR1: Stronger and Clearer
- MLR3: Critique, Correct, and Clarify
- MLR4: Info Gap
- MLR5: Co-craft Questions and Problems
- MLR7: Compare and Connect
- MLR8: Discussion Supports

Maximize Linguistic and Cognitive Meta-Awareness
- MLR2: Collect and Display
- MLR3: Critique, Correct and Clarify
- MLR5: Co-craft Questions and Problems
- MLR6: Three Reads
- MLR7: Compare and Connect
- MLR8: Discussion Supports

Language Routines
Cultivate Conversation

- MLR3: Critique, Correct, and Clarify
- MLR5: Co-craft Questions and Problems
- MLR7: Compare and Connect
- MLR8: Discussion Supports

Maximize Linguistic and Cognitive Meta-Awareness

- MLR3: Critique, Correct and Clarify
- MLR5: Co-craft Questions and Problems
- MLR7: Compare and Connect
- MLR8: Discussion Supports
MLR3 Critique, Correct, and Clarify
• Example: Critique a Partial or Flawed Response (pg. 12)

MLR5 Co-craft Questions and Problems
• Example: Co-Craft Questions (pg.14-15)
• Example: Co-craft Problems
• Example: Co-craft Situations

MLR7 Compare and Contrast
• Example: Which One Doesn’t Belong (pg.17)

MLR8 Discussion Supports
• Example: Numbered Heads (pg.18)
Making Connections

MLR3: CRITIQUE, CORRECT, AND CLARIFY

Critique a Partial or Flawed Response

1. **Present:** Present a partial/broken argument, explanation, or solution method.
   - Given response could include a common error.
   - Given response should include an ambiguous term or phrase, or an informal way of expressing a mathematical idea.

2. **Prompt:** Prompt students to identify the errors or ambiguity, analyze the response in light of their own understanding of the problem, and work both individually and in pairs to propose an improved response.

3. **Share:** Pairs share out draft improved response.

4. **Refine:** Students refine their own draft response.

OCDE PROJECT GLAD®

Inquiry Chart
(Processing)

ELD Group Frame
(Processing)
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MLR5: CO-CRAFT QUESTIONS AND PROBLEMS

Co-Craft Questions, Problems, Situations

Teacher presents a situation, problem or a mathematical representation (graph, function, table, etc.) without labels.

Students generate possible mathematical questions, co-create problems, and write stories that correspond to the given information.

Students share and compare their work with other pairs or whole class.

Students receive and respond to feedback from peers and teacher.
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Making Connections

MLR7: COMPARE AND CONNECT

Which One Doesn’t Belong?

Pairs of students are provided with sets of four numbers, equations, expressions, graphs, or geometric figures. They must decide together how to group the sets so that three of the items fit within a category they have created and one does not. Both partners should be prepared to explain to a different group how they agree on a category and justify which item did not fit.
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<td><strong>Numbered Heads Together</strong></td>
<td><strong>Collaborative Learning</strong></td>
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<td>1. Students count off</td>
<td>10/2</td>
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<td>3. Heads together</td>
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TEACHER ESTIMATES OF ACHIEVEMENT

EFFECT SIZE OF 1.62

JOHN HATTIE, VISIBLE LEARNING (2015), VISIBLE-LEARNING.ORG
Those who have the privilege to know have the duty to act.

~ Albert Einstein (1879-1955)