2013 Mathematics SOL Institutes

The purpose of the 2013 Mathematics SOL Institutes is to provide teachers with professional development focused on the relationship between curriculum, instruction, and assessment, by targeting the processes of analysis and modification of existing resources to match student learning expectations and promote problem solving.

Introduction and Instructions

This grade-band professional development will be comprised of two components:

- Module 1 Parts 1-4: Analyzing and modifying assessments – Participants will compare expectations of SOL and Curriculum Framework to an assessment and modify it to meet intended expectations.
- Module 2 Parts 1-3: Modifying mathematical tasks to promote problem solving – Participants will modify existing mathematical tasks to emphasize the use of process skills and problem solving.

Virginia's Process Goals for Students

SOL Vertical Articulation Technical Assistance Documents

- Grades K-3
- Grades 3-6
- Grades 5-8
- Algebra
- Geometry

The product of the 2013 Mathematics SOL Institutes is a set of online professional development modules designed to be used by a group of teachers of a specific grade level or course. Modifications could be made to adapt the professional development for more than one grade level/course or for large groups. Each group of teachers should select a facilitator for which this Facilitator's Guide was written. Facilitators should review the activities and handouts prior to facilitating this professional development.

Approximate Time	Facilitator Instructions	Materials
30 minutes total	**Module 1 Part 1: Analysis of Assessments**	• Mathematics Assessment (select the assessment for your course) - Algebra I - Geometry - Algebra II • Assessment Analysis Guiding Questions
15 minutes	1) Select and distribute the appropriate assessment for your whole group. 2) Ask participants to complete the assessment individually. While working, participants should be thinking about whether or not it is a "good" assessment and why.	
15 minutes	3) Have participants discuss their conclusions with a partner or small group. 4) Have small groups share and record their conclusions and justifications with the whole group. 5) View the Assessment Analysis Guiding Questions document and discuss similarities and differences.	

Approximate Time	Facilitator Instructions	Materials
55 minutes total	**Module 1 Part 2: Analyzing SOL Alignment and Level of Cognitive Demand**	
20 minutes	1) In small groups, brainstorm and record characteristics of mathematics tasks/problems that require a high level of cognitive demand. 2) Have groups share their recorded characteristics. Record and discuss the similarities and differences compared with those found in the Cognitive Demand Characteristics.	• Cognitive Demand Characteristics • Curriculum Framework pages for specific Assessments - Algebra I - Geometry - Algebra II • Assessment SOL Alignment and Cognitive Demand - Algebra I - Geometry - Algebra II
35 minutes	3) For each problem in the focus assessment, have small groups identify a) whether or not each problem is aligned to the intended SOL (using Curriculum Framework documents to justify), and b) the level of cognitive demand of each problem as "low," "medium," or "high." Each group should be able to justify their consensus. 4) Compare the groups' SOL alignment and levels of cognitive demand of each problem with those provided in the "Assessment SOL Alignment and Cognitive Demand" in the right-hand column. 5) Discuss as a whole group – "Does the assessment have a variety of problems requiring various levels of cognitive demand? Is there a balance?"	
55 minutes total	**Module 1 Part 3: Modifying Problems to Raise the Level of Cognitive Demand**	
35 minutes	1) Select two of the low-level problems from the Assessment Modification Worksheets you identified in Module 1 Part 2 #4 and modify them to raise the level of cognitive demand to a high level. 2) Record your work on the handouts provided for each low-level problem in the right-hand column. 3) Share your modified problems with the whole group and order by level of cognitive demand required.	• Assessment Modification Worksheets - Algebra I - Geometry - Algebra II
20 minutes	4) Discuss as a whole group your strategies for raising the level of cognitive demand. Compare your discussion to these strategies. - Providing context/requiring application - Choosing numbers intentionally - Increasing the number of required steps - Changing the unknown/given information - Allowing for multiple solutions	

Approximate Time	Facilitator Instructions	Materials
	- Requiring students to explain, justify, and make connections between representations	
30 minutes total	**Module 1 Part 4: Creating a Balanced Assessment and Connecting Assessment to Instruction**	
20 minutes	1) As a group, select replacement items from the modified assessments created in Module 1 Part 3 #1 to balance the level of cognitive demand required in the assessment. 2) Discuss why balancing assessments is necessary.	
10 minutes	3) Discuss as a whole group – "How will the assessment analysis and modification work impact planning, instruction, and assessment?"	
45 minutes total	**Module 2 Part 1: Doing the Mathematical Task**	• Video – Dan Meyer: Math Class Needs a Makeover (11:39) • Task: Organizing a Table Tennis Tournament © 2012 The University of Nottingham. Mathematics Assessment Project
20 minutes	1) View the video "Dan Meyer: Math Class Needs a Makeover."	
25 minutes	2) Have each participant solve the task "Organizing a Table Tennis Tournament" and list the mathematical or problem-solving decisions that are being made for students. 3) Have participants share their different methods of solving the task to the whole group. 4) Ask participants share the decisions that were being made for students with the whole group and discuss.	
45 minutes total	**Module 2 Part 2: Returning Decision-Making and Problem Solving to Students**	• Less-structured version of the Organizing a Table Tennis Tournament task
25 minutes	1) In small groups, discuss how the task could be revised to return decision-making to students. 2) Have each group share their revisions to the task.	
20 minutes	3) Have each small group compare and contrast their "less-structured" version of the task with the one provided. 4) Discuss as a whole group – "What would be the benefits of using more unstructured tasks?" and "What challenges might teachers and students face when using unstructured tasks?"	
40 minutes total	**Module 2 Part 3: Teaching Problem Solving**	• Practical advice for teaching problem solving
15 minutes	1) In small groups, have participants review the handout "Practical advice for teaching problem solving."	

Approximate Time	Facilitator Instructions	Materials
	2) Discuss as a whole group – "What do you notice? "What do you wonder?" "What would you add to this list?"	
10 minutes	3) View the video "Organizing a Table Tennis Tournament."	• Video – Organizing a Table Tennis Tournament (9:18) © 2012 The University of Nottingham. Mathematics Assessment Project • Video Reflection Organizer
15 minutes	4) Discuss as a whole group – - How did the teacher introduce the task/organize the lesson? - Why were students asked to work in small groups? - How did the teacher support struggling students? - How did the teacher encourage sharing of approaches and strategies? - Where did you find evidence of process goals?	