Planning Resources from SCSD

1. Planning Document – in participant packet
2. Planning Checklist – in participant packet
3. Routines of a Lesson
4. Appendix B – Lesson Planning Template
5. Task Analysis Guide (TAG)
6. Thinking Through a lesson Protocol
7. Monitoring Tool Template
Routines of a Lesson

Set-Up of the Task

The Explore Phase/
Private Work Time
Generate Solutions

The Explore Phase/
Small Group Problem Solving
1. Generate and Compare Solutions
2. Assess and Advance Student Learning

Share, Discuss, and Analyze
Phase of the Lesson
1. Share and Model
2. Compare Solutions
3. Focus the Discussion on Key Mathematical Ideas
4. Engage in a Quick Write

MONITOR: Teacher selects examples for the Share, Discuss, and Analyze Phase based on:
- Different solution paths to the same task
- Different representations
- Errors
- Misconceptions

SHARE: Students explain their methods, repeat others' ideas, put ideas into their own words, add on to ideas, and ask for clarification.

REPEAT THE CYCLE FOR EACH SOLUTION PATH.

COMPARE: Students discuss similarities and differences between solution paths.

FOCUS: Discuss the meaning of mathematical ideas in each representation.

REFLECT: Engage students in a Quick Write or a discussion of the process.
<table>
<thead>
<tr>
<th><strong>Learning Goals (Residue)</strong></th>
<th><strong>Evidence</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>What understandings will students take away from this lesson?</td>
<td>What will students say, do, produce, etc. that will provide evidence of their understandings?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Task</strong></th>
<th><strong>Instructional Support—Tools, Resources, Materials</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the main activity that students will be working on in this lesson?</td>
<td>What tools or resources will be made available to give students entry to, and help them reason through, the activity?</td>
</tr>
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<table>
<thead>
<tr>
<th><strong>Prior Knowledge</strong></th>
<th><strong>Task Launch</strong></th>
</tr>
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<tbody>
<tr>
<td>What prior knowledge and experience will students draw on in their work on this task?</td>
<td>How will you introduce and set up the task to ensure that students understand the task and can begin productive work, without diminishing the cognitive demand of the task?</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th><strong>Anticipated Solutions</strong></th>
<th><strong>Instructional Support—Teacher</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the various ways that students might complete the activity?</td>
<td>What questions might you ask students that will support their exploration of the activity and bridge between what they did and what you want them to learn?</td>
</tr>
<tr>
<td>Be sure to include incorrect, correct, and incomplete solutions</td>
<td>These questions should assess what a student currently knows and advance her towards the goals of the lesson. Be sure to consider questions that you will ask students who can't get started as well as students who finish quickly.</td>
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</tbody>
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Use the monitoring tool to provide the details related to **Anticipated Solutions** and **Instructional Support**

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Based on Smith, Bill, and Hughes, 2008
<table>
<thead>
<tr>
<th>Selecting and Sequencing</th>
<th>Connecting Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which solutions do you want to have shared during the lesson?</td>
<td>What specific questions will you ask so that students</td>
</tr>
<tr>
<td>In what order? Why?</td>
<td>- make sense of the mathematical ideas that you want them to learn</td>
</tr>
<tr>
<td></td>
<td>- make connections among the different strategies/solutions that are presented</td>
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</tbody>
</table>

1 Each lesson plan should be labeled as follows: lastname-subject-period-date. For example, a lesson in John Jones 5th period algebra class on September 10th would be labeled Smith-algebra5-09.10.15

Based on Smith, Bill, and Hughes, 2008
The Mathematical Task Analysis Guide (TAG)

<table>
<thead>
<tr>
<th>Lower-Level Demands</th>
<th>Higher-Level Demands</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Memorization Tasks</strong></td>
<td><strong>Procedures With Connections Tasks</strong></td>
</tr>
<tr>
<td>• Involves either producing previously learned facts, rules, formulae, or definitions OR committing facts, rules, formulae, or definitions to memory.</td>
<td>• Focus students’ attention on the use of procedures for the purpose of developing deeper levels of understanding of mathematical concepts and ideas.</td>
</tr>
<tr>
<td>• 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.</td>
<td>• 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.</td>
</tr>
<tr>
<td>• Are not ambiguous – such tasks involve exact reproduction of previously seen material and what is to be reproduced is clearly and directly stated.</td>
<td>• Usually are represented in multiple ways (e.g., visual diagrams, manipulatives, symbols, problem situations). Making connections among multiple representations helps to develop meaning.</td>
</tr>
<tr>
<td>• Have no connection to the concepts or meaning that underlie the facts, rules, formulae, or definitions being learned or reproduced.</td>
<td>• 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 understanding.</td>
</tr>
</tbody>
</table>

**Procedures Without Connections Tasks**

• 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.
• Require limited cognitive demand for successful completion. There is little ambiguity about what needs to be done and how to do it.
• Have no connection to the concepts or meaning that underlie the procedure being used.
• Are focused on producing correct answers rather than developing mathematical understanding.
• Require no explanations, or explanations that focus solely on describing the procedure that was used.

**Doing Mathematics Tasks**

• Requires complex and non-algorithmic 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).
• Requires students to explore and to understand the nature of mathematical concepts, processes, or relationships.
• Demands self-monitoring or self-regulation of one’s own cognitive processes.
• Requires students to access relevant knowledge and experiences and make appropriate use of them in working through the task.
• Requires students to analyze the task and actively examine task constraints that may limit possible solution strategies and solutions.
• Requires considerable cognitive effort and may involve some level of anxiety for the student due to the unpredictable nature of the solution process required.

Thinking Through a Lesson Protocol (TTLP)

Fig. 2 Thinking Through a Lesson Protocol (TTLP)

**PART 1: SELECTING AND SETTING UP A MATHEMATICAL TASK**

What are your mathematical goals for the lesson (i.e., what do you want students to know and understand about mathematics as a result of this lesson)?

In what ways does the task build on students' previous knowledge, life experiences, and culture? What definitions, concepts, or ideas do students need to know to begin to work on the task? What questions will you ask to help students access their prior knowledge and relevant life and cultural experiences?

What are all the ways the task can be solved?

- Which of these methods do you think your students will use?
- What misconceptions might students have?
- What errors might students make?

What particular challenges might the task present to struggling students or students who are English Language Learners (ELL)? How will you address these challenges?

What are your expectations for students as they work on and complete this task?

- What resources or tools will students have to use in their work that will give them entry into, and help them reason through, the task?
- How will the students work—independently, in small groups, or in pairs—to explore this task? How long will they work individually or in small groups or pairs? Will students be partnered in a specific way? If so, in what way?
- How will students record and report their work?

How will you introduce students to the activity so as to provide access to all students while maintaining the cognitive demands of the task? How will you ensure that students understand the context of the problem? What will you hear that lets you know students understand what the task is asking them to do?

**PART 2: SUPPORTING STUDENTS' EXPLORATION OF THE TASK**

As students work independently or in small groups, what questions will you ask to—

- help a group get started or make progress on the task?
- focus students' thinking on the key mathematical ideas in the task?

- assess students' understanding of key mathematical ideas, problem-solving strategies, or the representations?
- advance students' understanding of the mathematical ideas?
- encourage all students to share their thinking with others or to assess their understanding of their peers' ideas?

How will you ensure that students remain engaged in the task?

- What assistance will you give or what questions will you ask a student (or group) who becomes quickly frustrated and requests more direction and guidance in solving the task?
- What will you do if a student (or group) finishes the task almost immediately? How will you extend the task so as to provide additional challenge?
- What will you do if a student (or group) focuses on non-mathematical aspects of the activity (e.g., spends most of his or her (or their) time making a poster of their work)?

**PART 3: SHARING AND DISCUSSING THE TASK**

How will you orchestrate the class discussion so that you accomplish your mathematical goals?

- Which solution paths do you want to have shared during the class discussion? In what order will the solutions be presented? Why?
- In what ways will the order in which solutions are presented help develop students' understanding of the mathematical ideas that are the focus of your lesson?
- What specific questions will you ask so that students will—
  1. make sense of the mathematical ideas that you want them to learn?
  2. expand on, debate, and question the solutions being shared?
  3. make connections among the different strategies that are presented?
  4. look for patterns?
  5. begin to form generalizations?

How will you ensure that, over time, each student has the opportunity to share his or her thinking and reasoning with their peers?

What will you see or hear that lets you know that all students in the class understand the mathematical ideas that you intended for them to learn?

What will you do tomorrow that will build on this lesson?

<table>
<thead>
<tr>
<th>Monitoring Tool (green - complete prior to lesson; yellow - complete during the lesson)</th>
<th>Order</th>
<th>Who/What</th>
<th>Assessing Questions</th>
<th>Instructional Support</th>
<th>Advancing Questions</th>
<th>Anticipated Solutions</th>
<th>Unanticipated Solutions</th>
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