# Virginia Department of Education 2018 Mathematics Institutes

# Facilitator’s Guide – Grade Band 3-5

## 2018 Mathematics Institutes

The purpose of the 2018 Mathematics Institute is to provide teachers with professional development grounded in the implementation of the [2016 *Mathematics Standards of Learning*](http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/2016/index.shtml) to strengthen the teaching and learning of mathematics through facilitating meaningful mathematical discourse, to include: posing purposeful questions; eliciting and using evidence of student thinking; using and connecting mathematical representations; and supporting productive struggle in learning mathematics; as well as supporting equitable learning opportunities for all students.

## Professional Development Instructions

A product of the 2018 Mathematics 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, facilitated by a member of the team. Modifications could be made to adapt the professional development for more than one grade level/course or for large groups. Facilitators should review the activities and handouts in this guide prior to facilitating this professional development.

| **Approximate Time** | **Facilitator Instructions** | **Materials** |
| --- | --- | --- |
| **65 minutes total** | **Module 1: Teaching Practice: Facilitating Discourse**  **Essential Questions:**  **What elements must be in place to support meaningful mathematical discourse?** |  |
| **25 minutes total**  1) Introductions, Agenda and Getting to Know you Activity  (10 min.)  2) Connect the Process Goals to the Mathematics Practices (15 min.) | 1. **Welcome and Introductions**  * Welcome and introduce facilitators. (Slides 1-2) * Getting to know you Activity: That’s Me. Read each statement and instruct participants to “Stand if this refers to you” and say “That’s me!” (Slide 3-4) * Share agenda and special information such as location of restroom. (Slide 5) * Explain how to work the Parking Lot. (Slide 6) * Share goals for the day. (Slide 7)  1. **Connecting the Eight Effective Teaching Practices and the Five Process Goals Jigsaw**  * Review the Mathematical Process Goals for Students in Virginia. These are the overarching goals for mathematics instruction in Virginia. It is important to note that with the 2016 standards revision the mathematical process goals are still driving the mathematical understanding. Students will learn the math content through the process goals of problem solving, connections, communication, representations, and reasoning. “The content of the mathematics standards is intended to support the five process goals for students”. (Slide 8) * Explain that the 2016 Standards are supported by the process goals and the 8 Mathematical Practices from NCTM. Read each one and refer to the handout with descriptions. (Slide 9) * As shared in the opening session, the book *Taking Action: Implementing Effective Mathematics Teaching Practices* has a chapter dedicated to each practice. Our work today will allow us to think deeply about several of the practices as we fully implement the 2016 Mathematics Standards of Learning. In this first section, we will take a little time to explore how the practices and the process goals connect. (Slide 10) * *Preparation: Place signs/posters around room with numbers 1-5 for groups to gather.* * Have participants find the Making the Connection Handout. Allow 3 minutes for participants to review the goals and practices. * Have participants count off from 1-5. Point out the numbered posters around the room representing each process goal, also numbered on the power point. * Have participants walk to the assigned numbered area to discuss the assigned goal and to decide which practice(s) connect to this assigned goal. Participants should mark it on the handout with an “x”. * Allow time for whole group sharing. Have each process goal group share which practices they marked. Place sticky notes on the large poster. * Explain that the practices are all important to a thriving math environment. This graphic shows how the practices are interconnected and support one another. (Slide 11) | * Grade Band 3-5 Session PowerPoint * Parking lot poster * [Numbered posters 1-5](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/number-wall-posters.docx) * [Making the Connection Handout](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/making-the-connection.docx) |
| **40 minutes total**   1. Which One Doesn’t Belong? (10 min.) 2. Mathematics Community (20 min.) 3. Closing (10 minutes) | 1. **Introduction to Facilitating Discourse**  * The first practice that we will focus on is Facilitating Discourse. Note that it is the lavender box on the graphic showing its importance as a foundation to the other practices. (Slides 12-13). * Share Essential Question: What elements must be in place to support meaningful mathematical discourse? (Slide 14) * On your Own:Jot down a few ideas on the modules reflection sheet. We will share and compare later. (Allow 3 minutes for participants to write)  1. **Which One Doesn’t Belong**  * Throughout our session today, we will engage you in Sense Making Activities that you will be able to take back and use with your classes. This first one is called “Which One Does Not Belong?” | * Grade Band 3-5 Session PowerPoint * [Modules Reflection Sheet](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/reflection-sheet.docx) * [Mathematics Community T-Chart Handout](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/math-community-t-chart.docx) and Large Chart * [Mathematics Discourse Resource](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/k-2/quest-stems-sent-frames.docx) * [Teaching Practices Research and Equity Handout](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/teaching-pract-research-equity.docx) |
|  | * Display Slide 15. Say: Consider which one does not belong and why? Think to yourself first, then when your neighbor is ready, share your thoughts with them. * Allow participants up to 3 minutes to think then share with their tables which picture doesn’t belong and why. * Facilitate sharing of thoughts as a whole group. (2 min.) * Display Slide 16, ask participants to repeat the process. * Facilitate sharing of thoughts as a whole group. Record the participant’s responses on a chart paper. Highlight how the “students” are using vocabulary and that this vocabulary is being developed in context. * Ask: When might it be useful to do an activity like Which one does not belong? Why is it useful? (If no one mentions it, share that it allows entry for all students into discourse and a mathematics community.)  1. **Mathematics Community**  * To have productive mathematical discourse, a strong mathematics community must be established. What is a mathematics community? (Slide 17) * Using the Mathematics Community Handout have participants talk about and record answers to what a Mathematics community is and what it is not. Write for 3 minutes. Share with table group for 3 minutes. * After approximately 6 minutes, facilitate sharing of ideas for T-Chart. Record thoughts on a large chart to leave displayed. Notice that characteristics of a math community is student focused and characteristics of what a math community is not are more teacher centered. * Share the pre-created T-chart (Slide 18) Compare with what they brainstormed. * For this community to thrive, student need to know how to communicate. Sometimes, we must provide models or frames to help students learn how to use math talk to convey their ideas. Have participants note the Math Discourse Resource bookmark on their tables. Ask: How might you use this resource? (Example: Make an anchor chart for students) (Slide 19)  1. **Closure and Reflection – Four Corners**  * (Display Slide 20) The resource that you are taking back to your schools/districts called Taking Action is dedicated to providing research and giving special attention to equitable practices for each of the Eight Teaching Practices. * At this time, we will analyze how facilitating meaning mathematical discourse is supported in the research and how it supports equitable teaching in the mathematics classroom. * The Research and Equity handout has four statements for this module. Use the Research and Equity handout to read and select one of the statements that strikes you as interesting. (Slide 20) * Each statement has a number assigned to it. When the signal is given, each participant should go to the corner of the numbered quote that they wish to discuss. Pair up with a colleague in that corner and discuss your chosen statement. If time allows, have someone from each corner share their discussion highlights. * Have participants return to seats. * As we close this module, have participants return to their thoughts on the sticky note from the beginning of the module on the essential question. Share with a neighbor and adjust with new thoughts as needed. (Slide 21) |  |

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| --- | --- | --- |
| **85 minutes total** | **Module 2: Teaching Practice: Pose Purposeful Questions**  **Essential Questions:**   * **How can posing purposeful questions be used to inform instruction and assess student understanding?** * **How does posing purposeful questions promote equitable learning opportunities for all students?** |  |
| 1. Alike and Different (5 min.) 2. Vertical Progression: Fraction Sense (15 min.) 3. Sharing Candy Bars (20 min) 4. Five Types of Questions (15 min.) 5. Polygon Task (20 min.) 6. Closure (10 min.) | 1. **Introduce Practice for the Module: Pose Purposeful Questions**  * Display Slides 22-23 to transition. Our next module is focused on Posing Purposeful Questions. Note where it is located on the graphic. * Share essential question: How can posing purposeful questions be used to inform instruction and assess student understanding? Tell participants to keep this in mind as we complete the activities. (Slide 24)  1. **Sense making Routine: Alike and Different**  * (Display Slide 25) Ask: How are these representations alike? How are they different? * Think of as many ways as you can to yourself. Then when your neighbor is ready, share your ideas.  1. **Vertical Progression: Fraction Sense**  * To explore the content, we will use for this module, we want to begin with unpacking the standards to see how students are going to develop fraction sense. (Slide 26) * Assign sections of the room for each grade level. Tell participants they will form Vertical teams with 3, 4, and 5th grade members. If you work with several or all levels, then you can choose a group, but each group should try to be as vertical as possible. * Form vertical teams: Have participants gather their handouts and a pencil, stand and use their fingers to represent which level they work with: Show 3 for 3rd, 4 for 4th, 5 for 5th and make a fist for other. * Use your Vertical Progression for Fraction Sense Handout. * Read and discuss guiding questions (Slide 26). * In small groups of 3-4, share what you noticed based on the guiding questions. * Share ideas whole group. Have participants return to their seats.  1. **The Sharing *Candy Bars Task***   **Part 1: Working the Problem**   * Tell participants that they will receive a task to complete and then we will discuss the types of questions that we asked as they processed the task. Ask participants to work the problem as they think their students would. Explain that facilitators will come around to ask them questions. After their work time, we will debrief and analyze the types of questions used. * Display and launch problem to participants. (Slide 27) At your table, you have index cards, scissors, blank paper, markers, pencils, post it notes, etc. as your access. * Note: As participants work, walk around to monitor, select, and then sequence which order you might ask them to share (if time allows) As you walk around, ask the 5 types of questions when appropriate. (See Possible Questions for Candy Bar Task Handout) * After 15 minutes, begin to ask people or tables to share. Ask them: Where do you see connections among your work. It would be helpful to identify three different solutions to highlight for the group.   **Part 2: Reflecting on the Questions**   * Reflect on the Questions: Think about the questions that we asked you as you worked and shared in terms of these questions. What were some of these questions? * (Display Slide 28) with the examples of questions. Discuss purpose and potential for each one. * Share the self-reflective set of questions on Slide 29. These can be used back in your schools to think about your own questioning. * Reveal the Five types of Questions. Reveal the examples of the questions the facilitator asked as you explain each one (Slide 30) * Pause to Reflect – (Slide 30) Turn and talk: Which types of questions do you ask the most? Have a few volunteers to share whole group. * Share stems for teachers. Discuss how this might be useful as an anchor chart or in a lesson plan book. Turn and talk about ways you have used stems like this…or how you will use it next year. (Slide 31)  1. **Vertical Progression: Geometry – Polygons**  * For the next part of this module, participants will create their own questions. We will explore Polygons. First, we will unpack and compare those standards. * Assign sections in the room for 3, 4 and 5. Form vertical teams using the Fingers and Fist Method from earlier. * Use your Vertical Progression for Geometry Handout to read and discuss guiding questions (Slide 32). * In small groups, share what you noticed based on the guiding questions. * Share ideas whole group. Return to your seats.  1. **The Polygon Task**  * Familiarize yourself with the Polygon Task. (Yes, Solve it) * Use the 5 types of questions handout to collaborate and create different types of questions that you would ask students as they work this task. (Slide 33) * After 15 minutes, share whole group for up to 5 min.  1. **Reflection - End the Module:** Restate the Essential Questions. (Slide 34)  * The Research and Equity handout has four statements for this module. Use the Research and Equity handout to read and select one of the statements that strikes you as interesting. (Slide 35) * Each statement has a number assigned to it. When the signal is given, each participant should go to the corner of the numbered quote that they wish to discuss. Pair up with a colleague in that corner and discuss your chosen statement. If time allows, have someone from each corner share their discussion highlights. * Have participants return to seats. * As they sit down have them read Slide 36. Discuss implications for their/our work. * Allow time for participants to reflect on module reflection sheet. | * [Vertical Progression Fraction Handout](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/vertical-prog-fractions.docx) * [Candy Bar Task](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/candy-bar-task.docx) * [Possible Questions for Candy Bar Task](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/poss-qs-candy-bar-task.docx) * [Five Types of Questions Handout](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/five-types-of-questions.docx) * [Mathematics Discourse Recourse](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/k-2/quest-stems-sent-frames.docx) * [Vertical Progression Geometry Handout](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/vertical-prog-geometry.docx) * [Polygon Task](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/polygon-task.docx) * [Teaching Practices Research and Equity Handout](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/teaching-pract-research-equity.docx) * Index Card, Scissors, Paper, Markers, Pencils, Post-It notes |

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| --- | --- | --- |
| **95 minutes total** | **Module 3: Teaching Practice: Elicit and Use Evidence of Student Thinking**  **Essential Question:**   * **How can eliciting and using evidence of student thinking be used to inform instruction and assess student understanding?** * **How does eliciting and using evidence of student thinking promote equity in the mathematics classroom?** |  |
| 1. Would you rather (10 min.) 2. Ambitious Teaching (10 min.) 3. Assessing and Advancing (10 min.) 4. Intentional advance planning (5 min.) 5. Vertical Progression Computational Fluency (15 min.) 6. Grade Level Task Planning (30 min.) 7. Closure (15 min.) | 1. **Introduce Practice for the Module: Elicit and Use Evidence of Student Thinking**  * Display Slides 37-38 to transition. This module is about eliciting and using the evidence of student thinking. Discuss how this practice fits in the Teaching Framework for Mathematics.  1. **Sense making Routine: Would You Rather?**  * Display Slide 40 and 41. Ask them would you rather and why? Like before have participants think first before sharing with colleagues. Slides 40 and 41 are low stakes routines that allows the participants to access the problems and also teaches the process. * Display Slide 41. Ask: Which set of jellybeans would you rather have? Why? Think to yourself. Then when your neighbor is ready, share your ideas. * Share essential question: How can eliciting and using evidence of student thinking be used to inform instruction and assess student understanding? (Slide 42)  1. **Ambitious Teaching**  * Read the quotes. Emphasize the red text. What resonates with you? * Read the quotes. Emphasize the red text. Again, Ask how does this link back to building a math community? How do these ideas link to the practices, the process goals? (Slides 43-44)  1. **Assessing or Advancing Questions**  * Earlier we discussed 5 types of questions, and you created questions to accompany the polygon task. Now we want to revisit those questions through a lens of Advancing and Assessing student understanding. Read way to categorize questions into two groups. (Slide 45) * Look back at your questions that you created from the Polygon Task. Determine and label each one advance or assess by each one. Share with a partner. * Allow a few participants to share an example of each assessing or advancing questions.  1. **Intentional Advanced Planning**  * Briefly, discuss how the facilitator had to plan ahead in order to make sure to ask intentional purposeful questions. Our goal was to elicit and assess thinking. Read quote. (Slide 46) * Share a sample planning guide. (Slide 47) Discuss that we will be using this later but what are somethings you might be noticing on the planning document.  1. **Vertical Progression: Computational Fluency**  * For the next part of this module, participants will use this planning guide. We will explore Computational Fluency to do this. First, we will unpack and compare those standards. * Assign a section for 3rd, 4th and 5th and form vertical teams. * Use your Vertical Progression for Computational Fluency Handout. Read and discuss guiding questions (Slide 48) * In small groups, share what you noticed based on the guiding questions. * Share ideas whole group.  1. **Grade Level Task Planning**  * Explore the Intentional Advance Planning Guide. Read each section to clarify expectation. (Slide 49) * Form vertical teams at assigned tables. * Choose the task that corresponds to your grade level. (Slide 50) Pass out Grade Level Task Handout. * Have participants think about how you might use this planning sheet to think deeper about your questioning. * Each participant should solve the appropriate grade level problem in at least two ways. * Have the participants share with a shoulder partner their different solution paths. * Participants will then use the guide to answer the four intro prompts, record at least three different ways to solve, and develop assessing and advancing questions for each strategy. * Share whole group. Discuss how the advancing questions were hard to come up and why was that the case.  1. **Reflection - End the Module:**  * Review the essential questions. (Slide 51) * The Research and Equity handout has four statements for this module. Use the Research and Equity handout to read and select one of the statements that strikes you as interesting. (Slide 52) * Each statement has a number assigned to it. When the signal is given, each participant should go to the corner of the numbered quote that they wish to discuss. Pair up with a colleague in that corner and discuss your chosen statement. If time allows, have someone from each corner share their discussion highlights. * Have participants return to seats. * Allow time for participants to reflect on module reflection sheet. | * [Vertical Progression Computational Fluency Handout](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/vertical-prog-comp-est.docx) * [Intentional Advance Planning Handout](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/intentional-adv-plan-temp.docx) * [Teaching Practices: Research and Equity Handout](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/teaching-pract-research-equity.docx) |

| **Approximate Time** | **Facilitator Instructions** | **Materials** |
| --- | --- | --- |
| **60 minutes total** | **Module 4: Taking Action**  **Essential Question:**   * **How will you plan to implement tasks to facilitate meaningful mathematical discourse?** * **How will you share this information with others?** |  |
| 1. Taking Action, Putting it all together, and Resources (40 min.) 2. Closing (up to 30 min.) | 1. **Introduce the module: Taking Action** (Slide 53)  * Share essential question, which was a large part of our goal for the day: * How will you plan to implement tasks to facilitate meaningful mathematical discourse? * How will you share this information with others? (Slide 54)  1. **Putting it All Together**  * Give participants a chance to read quote. How does this connect to the Process Goals and Eight Mathematics Practices? (Slide 55) * Remind participants that this type of instruction supports a math community. We will now look specifically at the important components of a math talk learning community. (Slide 56) * Each table will sort the strips onto the organizer. (Slide 57) Allow 15 min. * Display one Slide at a time to share the correct answers and discuss highlights of different levels and roles. (Slides 58-62) | * [Classroom Discourse Sort](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/clssrm-discourse-sort.docx) * [Levels of Classroom Discourse](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/levels-of-class-discour.docx) * [Taking Action Reflection Handout](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2018/3-5/reflection-taking-action.docx) |
|  | 1. **Resources**  * Share resources used throughout the session and that are available on VDOE. (Slide 63) * Share resources for initiating student engagement. (Slide 64)  1. **Closure:**  * Reflection: How will you plan to implement tasks to facilitate meaningful mathematical discourse? How will you share this information with others? * Take time to complete this personal planner. Feel free to add details such as big ideas, aha’s, things to start, stop, continue, who you plan to share with, even a timeline. This is your planner and way to help you begin to process how you will share what you experienced today. (Slide 65) * After 15 minutes, encourage participants to share and network. Have a few participants share whole group. * Share VDOE contact info. (Slide 66) |  |