Analyzing Visuals Routine (AVR) Overview

Purpose: This Analyzing Visuals Routine (AVR) engages students in analyzing sample number/algebra diagrams or geometric drawings. It complements the Creating Visuals Routine (CVR) because the intent is for students to learn new visual ways to represent and approach mathematical situations, which will help them in their own diagramming and geometric drawing.

- In number/algebra situations (e.g., Session 3), students analyze sample diagrams to learn about how different types of diagrams can represent important quantities and relationships to make sense of a problem situation.
- In geometric situations (e.g., Session 6), students analyze sample geometric drawings to learn about how drawings and changes to drawings can reveal properties and relationships important to the geometric situation.

Structure: The AVR comprises the four parts, parallel to the structure of the CVR: *Launch, Analyzing Sample Visuals, Sharing/Discussing, and Reflecting on Learning*. Students are presented with a strip or storyboard depicting a fictitious student's step-by-step construction and manipulation of a math drawing or diagram used to make sense of a mathematics task. Students are asked to make sense of the fictitious student's drawings/diagrams by identifying the information (e.g., quantities, properties, relationships) represented in the visual and explaining how that information is represented. The AVR includes full group discussion of the sample visuals in order to tease out how different visuals represent information, and it concludes with time for reflecting on the use of visuals.

Support for Student Language Access and Production: Throughout the AVR, key academic language related to the mathematics, the diagrams or visuals, and the task context is surfaced, defined, and used by students to communicate their mathematical thinking. Similar to the CVR, the structure of the AVR incorporates mechanisms (e.g., think, pair, share) that support access to language and production of language by students who are English Learners. In addition, at key moments in the AVR teachers are asked to insert appropriate language access and language production strategies tailored to the particular sample diagrams/visuals and/or the English proficiency levels of students who will engage with the task. The AVR is used during two MCSEL sessions. Particular language access and production strategies are modeled in each case and should be used during the classroom inquiry cycle that follows that session. Teachers may incorporate additional language access and production strategies at key moments in the routine as appropriate.

Complementary Activities: The AVR is the focus of MCSEL Sessions 3 and 6; however, every time teachers engage with (or engage their students in) the CVR, time is included for "analyzing visuals" when the full group shares/analyzes diagrams or visuals created by other participants. In addition, "warmup" problems from some MCSEL sessions can be used with students to supplement the CVR and AVR to provide students with additional experiences with creating or analyzing visuals. **And of course, teachers are strongly encouraged to use the CVR, the AVR, the warmup problems, and language access and language production strategies in their regular lessons with students as appropriate, not only when engaging in formal MCSEL classroom inquiry cycles**.

  Supported by IES, U.S. Dept. of Ed., grant R305A11076.
The opinions expressed are those of the authors and do not represent the views of the Institute or the U.S. Dept of Ed.

Analyzing Visuals Routine Number/Algebra Version Session 3 – Launch and Analyzing Sample Visuals

Launch (~5 min.)

Students learn why they will be examining and discussing sample diagrams or geometric drawings during today's class, and they get oriented to the sample visuals and any relevant academic language.

Launch Instructions:

1. Display and explain routine *purpose* and *process* to students.
2. Explain any academic *language/vocabulary* targets and make *connections* to prior tasks or concepts, if appropriate.
3. Distribute or display math task and sample visual and ensure that all students understand the task context and instructions as appropriate.
4. Orient students to the visual strip. Explain that the strip shows how another student created a diagram. The four rectangles show four steps that the student took. Display complete visual strip. With their pencils down have students look at the strip for 15-30 seconds. Ask "What do you notice/see?" Record responses, pointing to visual or having students point at the visual to indicate what they are noticing/seeing.

Language Access Alert
Choose an *Access* Strategy that will ensure student understanding of the task context and instructions.

Analyzing Sample Visuals (~15 min.)

Students work individually to analyze and make sense of the sample diagrams or geometric drawings then share, discuss, and work more on unpacking those diagrams/geometric drawings in pairs.

Analyzing Sample Visuals Instructions:

1. *Set-up individual work:* Remind students they are NOT solving a math task right now and they are NOT creating their own diagram either; they are trying to understand a diagram or visual that someone else created. During the individual work time, students should complete answer the question in Section A of the Sample Diagram handout about the quantities, relationships, and/or geometric figures they see in the sample diagram and complete the sentence starter in Section B of the handout about what they wonder about the sample student's approach.
2. *Individual work:* Give students 2-3 minutes to look at the sample diagrams/geometric drawings individually and complete the sentence starters. Circulate but do not intervene unless you have planned to support access to the task instructions for individual students.
3. *Set-up pairs work:* Tell students to 1) share what they noticed and wondered, 2) work together to make sense of each step of the sample student's approach, 3) write an explanation of each step of the sample student's approach in the space below each frame on the handout.
4. *Pairs work:* Give students about 12-13 minutes to work together on making sense of the sample visual approach. Circulate and ask questions that model academic language use and assess student understanding of the sample visual. Examples for number/algebra:
    - What quantity did the student represent first (or in step #...)?
    - Point to a quantity/relationship you see in the student's diagram.
    - What relationships do you see in the diagrams?
    - How did the student show the relationship between (xxx) and (yyy)?
    - How did the student use his/her diagram to solve the problem?
    - What did the student change from Step 1 to 2? What did the student change from Step 1 to 2?

Language Access Alert
Frame questions for a range of English

Analyzing Visuals Routine Template Part II –Sharing/Analyzing and Reflecting on Learning

Sharing/Discussing (~8 min.)

Students analyze and discuss the sample diagrams or other visuals in the full group. Students identify how the sample diagrams or geometric drawings represented quantities and relationships between quantities (for number/algebra tasks) or properties of figures and relationships between those figures (for geometry tasks) and what characteristics of the sample student's use of diagrams or visuals seemed to be helpful for thinking about the mathematics task.

Sharing/Analyzing Instructions:

1. *Full Group Share*: Display the visual strip and have student pairs describe their understanding of the sample student's approach. After each pair has shared, other students in the class should indicate if they agree or disagree. And explain why.
   - When students share, have them point to the displayed diagram or geometric drawing to illustrate.
   - Annotate the diagram with student observations and invite clarifying questions from students.
2. Once students understand the sample student's approach, direct the discussion to how the diagram or geometric drawing was made and /or changed to reveal important information. Ask:
   - What quantities did the student represent? How?
   - How did the student represent the relationship…..?
   - What helped you see a solution path in this student's diagrams or drawings?
   - What changes/additions helped you follow the student's thinking?
   - How did the student show important quantities, properties and relationships? What change/addition helped you see a helpful geometric idea not in the original picture?

Language Production Opportunity

Consider how to support all students in their academic language use during sense-sharing (e.g. through strategic partnering, prompting choral response, word bank, sentence

Language Access Alert

Connect verbal statements made during the full group sharing to visual and gestures.

Reflecting on Learning (~5 min.)

Students engage in a write/pair/share to reflect on and share about what they learned about diagramming or geometric drawings by analyzing a sample visual.

Reflecting on Learning Instructions:

1. Remind students that the goal today was not to get an "answer," but to learn more about how to create/analyze diagrams by seeing how another student created a diagram or geometric drawing. Also remind students that there are many different ways to create diagrams or to add to geometric drawings, this sample is just one way.
2. Display one or more sentence starters or frames and ask students to individually write a complete sentence using a sentence starter/frame. Example sentence starters or frames for diagrams or for geometric drawings:

   <u>For diagrams:</u>
   - When representing quantities in a diagram, I will… because…..
   - The next time I create a diagram, I will include…. because…
   - An important characteristic of a useful diagram is…. because…

   <u>For geometric drawings:</u>
   - Arrows help me see… (Or, Dotted lines can represent…)
   - When looking at a geometric drawing pay attention to…
   - The next time I work on a geometry problem, I will consider drawing…. because…
3. Have students read their completed sentence frame to a partner.
4. Ask several students to share their reflection(s) with the whole class.

Language Access Alert

Consider English proficiency levels when choosing sentence frames