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**.

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

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Mathematics Coaching Supporting English Learners
Strategies for Supporting Language Access and Production

The strategies in the table below are included in the MCSEL project. Most strategies included here could be used for one or both access and/or production depending on how they are implemented.

Session	Strategy Name	Language Access	Language Production
1	3 Reads	✓	
3	Clarifying Vocabulary I	✓	
3	Informed Word Bank		✓
4	Acting Out and Realia	✓	
4	Differentiated Teacher Questions		✓
5	Sentence Starters		✓
6	Clarifying Vocabulary II: Gesturing, Action Words, and Color	✓	
6	Teacher Revoicing		✓
7	Frayer Model	✓	
7	Sentence Frames		✓

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3 READS STRATEGY OVERVIEW

Rationale

The 3 Reads strategy is a language access support that can help students who are English learners (ELs) make sense of mathematics text such as a word problem. It is designed for use during the sense-making or launch of a mathematics task. It is based on the idea that reading a math word problem requires a different approach than reading prose, in part because the purpose (e.g. the question to be answered) typically does not appear until the end of the passage. Since the reader does not know the purpose until the end, it can be difficult to determine the importance of the information within the text. In addition, math problem text is often dense and may include unfamiliar academic language. Reading it more than once may strengthen students' understanding of a text. Although the 3 Reads strategy can be successfully used individually or quietly, repeated reading out loud in a group or class context provides additional support to students who are ELs by providing opportunities to hear and see the language multiple times.

Implementation

The 3 Reads strategy uses three readings of the text in order to make sense of the material:

1. The first read is to get a sense of context in order to understand the "story" or big idea of the text. Students should not focus on the quantities or relationships between them during this reading.
2. The second read is to discern the question or purpose of the text. The problem is read again in its entirety, looking specifically for information about what needs to be answered or done to be successful.
3. The third read of the text is to gather important information that is needed to solve the problem or achieve the purpose of the task, such as specific quantities and their relationships.

A graphic organizer or template can be helpful for students using this strategy. The next page shows a generic template for a handout that guides the use of the 3 Reads strategy and then provides space for drawing a visual. Note: This template could also be used with the section for drawing a diagram or visual removed if students are working on a mathematics task where visuals are not relevant, but the focus in this work is on supporting student use of visuals as a thinking tool.

CLARIFYING VOCABULARY I STRATEGY OVERVIEW

Rationale

The Clarifying Vocabulary Strategy is a language access strategy to help students who are English learners (ELs) make sense of the mathematics. In a math task, some vocabulary, terms, or phrases in a task may be unfamiliar to students, in particular the meaning of the term or phrase or its use in mathematics may be unfamiliar. The goal of this strategy is to think carefully about which terms or phrases need clarification and which do not, and when and how during the lesson these terms or phrases should be clarified. When vocabulary and phrases are clarified, it should be to support students' understanding of the mathematics, the task, and the related vocabulary, with a focus on providing students just enough access to the language of the task so they can work toward the mathematics and language objectives of the lesson. Defining terms should not replace the mathematical work of the lesson, but instead, should help students understand formal or informal definitions of words to strengthen both students' communication and their understanding of the task.

This strategy can be strongly tied in with other language access strategies emphasized in the MCSEL materials. For example, the 3 Reads strategy (used in several sessions) provides opportunities for clarifying language (e.g., the teacher can clarify with students important terms when they come up during student sharing). Also, the Realia/Acting Out strategy (highlighted in Session 4) and the Frayer Model strategy (highlighted in Session 7), both provide related strategies for clarifying language. The emphasis during this session is on selecting words or phrases that need clarification and thinking about what is important for students to know about those words or phrases. In addition, in this session the strategy is started during the 3 Reads strategy, and it is used in the context of creating an Informed Word Bank.

Implementation

The Clarifying Vocabulary Strategy should generally be implemented during the sense-making or launch of a mathematics task in order to provide all students access to the language in math task. Teachers should be alert to highlight and clarify phrases used to describe quantities that will be important to understand, such as "number of" or "amount of." Other important terms to include are any that have to do with mathematical relationships, such as " more than." Additionally, terms such as "left" could be referring to the remaining amount, such as "the amount left in the tank," or a direction, such as "the person on the left of the presenter," and in reviewing a task, it is important to recognize the terms that may have multiple meanings or a mathematical meaning and discuss the meaning as it relates to the task. In clarifying terms with students, encourage students to share their understandings of the terms and work to build on their understandings so it includes mathematical meanings that are specific to the task.

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INFORMED WORD BANK STRATEGY OVERVIEW

Rationale

The Informed Word Bank is a language production support that can help students who are English learners (ELs) make sense of mathematics text and vocabulary that is in a word problem and then use that mathematical language in their speaking and writing. In contrast to a generic word bank, an Informed Word Bank includes phrases and terms related to the problem context or task as well as words and phrases that students and teachers find important or raise during discussions about the problem. Similar to other types of "word banks," the Informed Word Bank keeps important words in writing visible to students throughout a lesson so that they can study the words and attempt to use them in their speaking and writing and so the teacher can point students to those terms and phrases and encourage the use of those terms and phrases. In this manner, an Informed Word bank helps to support ELs' language production by providing them with access to mathematical language that they can use to communicate with others about the math task and their mathematical reasoning. When teachers ask students to use particular words or phrases from the Informed Word Bank, they are prompting language production in all their students, but especially the ELs, These practices provide access and opportunities to rich mathematical language for students of different English proficiency levels.

Implementation

The Informed Word Bank is usually generated during the launch of the problem as students bring up phrases and terms that are in the context of the problem and that they use in their discussion of the problem or during the reading of the problem (e.g., while engaging in the 3 Reads strategy). Teachers can also highlight and clarify other terms or phrases that they determine in their planning will support students' understanding and communication. Teachers collect the words and phrases into an Informed Word Bank and encourage students to reference the Word Bank when they write individually and when they communicate in partner talk and full-group share. The teacher may highlight when students use words from the word bank by pointing them out in the informed word bank. Depending on the task and the needs of the students in the class (e.g., their English proficiency levels) the teacher may choose to categorize the words that go into the Informed Word Bank (e.g., listing action words and nouns in different places, or writing words from different categories in different colors). Teachers should select when in the lesson they will encourage students to use words from the Informed Word Bank, and should determine which words or phrases are important for all or some students to focus on (and then indicate those words by circling them or having students write them on their papers).

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ACTING OUT AND REALIA
LANGUAGE ACCESS STRATEGY OVERVIEW

Rationale

Acting Out and Realia are language access supports that can help students who are English learners (ELs) make sense of mathematics text such as a word problem. Acting out is used in the creating visuals activity to help students who are ELs interpret text through watching an enactment of the task context while hearing the language in the task. An active visual demonstration provides an additional support to students who are ELs by hearing and seeing the language used. The use of realia, real objects such as candies, cups, and bags during the acting out in the *Sara's Candies* routine, can help students who are ELs interpret the context and learn vocabulary by seeing and experiencing "hands-on" objects represented by words in the text.

Implementation

These strategies can be used separately. For example, in the launch of the Sara's Candies task, a teacher could show students a bag of candy as the task is read, without any acting out. Similarly, during a task that includes the word "gallon" a teacher could bring in a gallon container. A teacher could include acting out without realia, for example in the *Sara's Candies* task by pretending to share [imaginary] candy without using any candy, small objects, or other realia. In some cases, using realia alone or acting out alone may be most appropriate. However, when possible, consider combining both strategies since this may provide a more comprehensive language access experience for students who are ELs. When implementing Acting Out with Realia, design the experience with the following considerations in mind:

- What context information is most important to convey with acting out and through the use of realia? What contextual information and language must students know to engage in the mathematics of the task?
- Who will perform the acting out? Will the teacher be the lead actor, be a director, or be in a supporting role? Which students (possibly including students who are ELs) will perform, and how will you communicate with them beforehand so they know what to do?
- What realia will be used, and how, to support the context and important language in the task?
- What other supports can integrated with the experience that provide additional language development support, such as strategies (e.g. 3 Reads, Clarifying Vocabulary, Sentence Starters) or props (e.g. name tags, cards with academic language, costumes or accessories).

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DIFFERENTIATED TEACHER QUESTIONS
LANGUAGE PRODUCTION STRATEGY OVERVIEW

Rationale

The Differentiated Teacher Questions strategy that may support students who are English learners (ELs) learn to speak and write academic language. Differentiated Teacher Questions can provide scaffolding for students who are ELs within the questions themselves, to support student access to the question content, and should be written so an appropriate response includes targeted academic language. Differentiated Teacher Questions can be used during any part of a lesson, including the launch and partner work time. Including targeted academic language in the question provides support to students who are ELs by providing more opportunities to hear appropriate use of the language multiple times.

Implementation

Before the lesson, consider the students who are ELs in your classroom and what parts of the lesson will include differentiated teacher questions. Thinking of the specific English proficiency levels of students in the classroom and the academic language you want these specific students to produce, write questions so students at the target English proficiency level can understand the question and are likely to use the targeted academic vocabulary in their response. Questions can include language access support within the question, such as:

- the desired academic language (in the question itself)
- rephrasing
- use of alternate word(s)
- use of translated word(s)
- gestures

Questions can be asked as sentence starters or sentence frames, and could be written or typed on small pieces of paper to give to students while you ask them. Questions or the targeted academic language could be written on student work or elsewhere in the classroom during the class period. Academic vocabulary that has been used before could also be referred to while you ask the question, such as underlining on a task handout, reminding students of an entry in a student vocabulary notebook, or pointed to on a word wall.

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SENTENCE STARTERS AND FRAMES STRATEGY OVERVIEW

Rationale

Sentence Starters and Frames are a language production support strategy that can help students who are English learners (ELs) communicate mathematically by support students as they craft and share their mathematical ideas verbally and in writing. Both sentence starters, which are incomplete sentences that students are asked to complete, and sentence frames, which are incomplete sentences where there may be more than one opening that needs to be completed or the opening in the sentence is between ("framed by") a beginning and end to the sentence, provide structures for students' writing and speaking. When given a sentence starter, a student does not need to first interpret a question and can instead focus on formulating their ideas (e.g., "The amount of candies (Raul/Jasmine/Sara) has is represented by…"). Both sentence starters and frames can also be used encourage students to use academic language that they may not have used otherwise or support them in using a specific academic term ("The ratio of girls to boys in Mr. Copper's class is shown by…" or "The next time I diagram a word problem I will include…. because…"). By providing students with Sentence Starters and Frames, students of different language proficiency levels can participate in verbal and written mathematical communication.

Implementation

Sentence starters and frames are used across the Creating Visuals Routine and Analyzing Visuals Routine as they can support students in their individual reflections, partner share, and full-group discussions. Sentence starters should be presented to students to both highlight key academic language (e.g., diagram, relationship, "the amount of") and also orient students to key mathematical ideas related to visually representing quantities and relationships that you would like them to discuss (e.g., creating visuals that are proportional or surfacing hidden relationships and then articulating how the visual does this). Teachers should model a range of sentence starters and sentence frames that could accommodate a range of English proficiency levels because some sentence starters, such as "A relationship I see is…," may be little more complex to understand than "The amount of candies Sara has is represented by…" and would thus be more appropriate for students with a higher English proficiency level; in other cases, a sentence frame may provide the additional language support that a student needs to complete a sentence using only a word or two. Sentence frames will be discussed further when exploring creating visuals in a geometry context in Session 7.

CLARIFYING VOCABULARY II STRATEGY OVERVIEW: GESTURING, ACTION WORDS, AND COLOR

Rationale

Some vocabulary or terms in a math task, in particular the meaning of the term or phrase or its use in *mathematics*, may be unfamiliar to students. The Clarifying Vocabulary Strategy involves determining which terms or phrases need clarification and thinking critically about when and how to clarify those terms or phrases during the lesson. The goals are to provide students with access to the language of the task, including formal or informal definitions, and strengthen their understanding of the task and their language production so they can work toward the mathematics and language objectives of the lesson. Clarifying vocabulary and phrases should support students' understanding of the task, the mathematics, and the related vocabulary, and should not replace students' involvement in the mathematical work of the lesson. This strategy ties in with other language access strategies emphasized in MCSEL materials, such as the Informed Word Bank, the 3 Reads strategy, the Realia/Acting Out strategy (highlighted in Session 4), and the Frayer Model strategy (highlighted in Session 7). The emphasis in this session is on selecting terms and phrases that need clarification, determining what is important for students to know about them, and then incorporating **gesturing, explicit categorization of action words,** and strategic use of **color** to support clarifying vocabulary.

Implementation

The Clarifying Vocabulary Strategy can support the sense-making or launch of a mathematics task in order to provide all students access to the language in math task and may be introduced during the initial phase of a lesson (e.g., during the 3 Reads strategy) or whenever teachers feel it fits for their students and the task (e.g., during partner work or in conjunction with creating an Informed Word Bank). Teachers should be alert to highlight and clarify phrases used to describe properties and relationships that will be important to understand; in a geometry context, these words may include "triangle," "area," and "square unit," as well as words students may use to transform the figure such as "rotate," "reflect," or "slide." In reviewing a task, it is important to recognize the terms that may have multiple meanings or a mathematical meaning and discuss the meaning as it relates to the task.

Gesturing when illustrating words can support student understanding, particularly of action words. Gesturing emphasizes manipulation and transformation and can be used when describing or analyzing visuals in a geometry context to support student understanding of steps or changes in a visual. When gesturing and clarifying terms with students in general, encourage students to share their understandings of the terms and work to build on their understandings so it includes mathematical meanings that are specific to the task. For example, follow a gesture about "rotating" with a connection to the mathematics of the task as well as a definition if appropriate.

Categorizing **action words** for operating on geometric visuals (shading, dissecting, etc.) and discussing these in comparison to nouns (e.g., triangle) may support student understanding and can be supported through gesturing.

Color can help delineate figures or steps in a diagram and clarify what a student is noticing or referring to with words or labels. Teachers can use color deliberately in their own diagramming and encourage students to use color in their diagrams, both in their independent and partner work and when sharing their diagrams in full-group discussions. Color can also differentiate between categories of words (e.g., action words and nouns described above) by listing different types of terms in different colors (e.g., in an informed word bank).

TEACHER REVOICING STRATEGY OVERVIEW

Rationale

Revoicing is a language production support that can help students who are English learners (ELs) as they craft and share their mathematical ideas verbally and in writing. This strategy involves listening closely to student thinking and then rephrasing and re-voicing student ideas, inserting mathematical vocabulary, asking students for clarity, and/or making suggestions of the relations between student's ideas to other strategies or vocabulary. By revoicing, teachers support student academic language production while relating the mathematical talk to the students' own ideas. To use revoicing most effectively, teachers should attend closely to students' ideas and then differentiate their response based on student language proficiency levels.

Implementation

Revoicing is an opportunity to highlight key academic language and orient students to key mathematical ideas. Revoicing can be used throughout a lesson; for example, this strategy can clarify terms and students' ideas during the beginning of a lesson when students share responses during the 3 Reads strategy, and it can be used when students are sharing their work during full group discussions. While revoicing, think critically about when and how to insert certain vocabulary, listening closely to students' own understanding to build on what students are saying and being mindful of student English proficiency levels. To avoid confusion, introduce only new academic vocabulary terms that are connected to the students' ideas. In a geometry context, revoicing could be used when students are discussing figures (e.g. a parallelogram), possibly by including the specific relevant vocabulary (e.g. parallelogram, side, vertex, parallel, quadrilateral), which would support students describing the figure and its properties or any related transformations more accurately. The aim of revoicing is to build on students' ideas in a manner that supports increasingly precise student communication (rather than evaluating or correcting student vocabulary usage).

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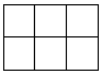
FRAYER MODEL STRATEGY OVERVIEW

Rationale

The Frayer Model is a language access support strategy that can help students who are English learners (ELs) make sense of mathematics terms and concepts. A Frayer Model is a graphic organizer that consists of a chart or 4-part frame within which you define the word, phrase, or concept, indicate its characteristics or facts about it, and provide examples and non-examples. This information is captured in separate spaces, similar to the example below. Sometimes the target word or concept is written in an oval or box in the middle of the chart, and sometimes the model includes different attributes such as essential characteristics and non-essential characteristics.

Area

Definition	Facts
space inside a 2-D shape number of square units inside	measure in square units (units^2) ↙ in.^{2} 2D objects like squares, circles
Examples	**Non-examples**
painted wall floor tiles garden wrapping paper surface  ← 6 square units	border perimeter  fencing to go around length neighborhood (not in math class!) volume/3D like inside a sphere

Using a Frayer Model can support students who are English learners by organizing learning of a new term or concept into separate, small steps. A Frayer Model can help students build understanding by activating and categorizing prior knowledge and making connections between terms and concepts through contrasting examples with non-examples. An advantage of using a Frayer Model is that it can structure clarifying discussions that go beyond simply providing definitions, as teacher(s) and students share, compare, and possibly negotiate responses as they collaboratively create meaning.

Implementation

Frayer Models can be used during the sense-making or launch of a mathematics task as a way to make sense of the mathematical vocabulary in a task or context. Students can work on them individually and in pairs, then the teacher can lead a whole class discussion asking students to share their own or their partner's responses. Sentence starters or frames can be used in conjunction with Frayer Models to help students share responses, e.g. "A non-example of ***area*** is.. because..." If Frayer Models are used regularly, a set of completed models can act as a reference.

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SENTENCE FRAMES STRATEGY OVERVIEW

Rationale

Sentence Frames are a language production support strategy that can help students who are English learners (ELs) communicate mathematically by supporting their written and spoken ideas. Sentence frames include given text after at least one "blank" to be completed, and may include multiple blanks; they are a close cousin of sentence starters, which include only a single blank at the end of the sentence (see a previous strategy overview for more information on sentence starters). Sentence frames provide support and scaffolding so students can formulate their own ideas using mathematical language within the structure of a sentence, such as "The next time I make a diagram I will... because..." Sentence frames may include key academic vocabulary for students to practice reading and/or speaking, such as "The ***ratio*** of.... is shown in the ***diagram*** by..." Both sentence starters and sentence frames support all students participating in verbal and written mathematical communication.

Implementation

Sentence frames can be used in the Creating Visuals Routine and in the Analyzing Visuals Routine to support students during their reflections, partner sharing, and full-group discussions. Although sentence frames may be a cloze question that can test student's ability to recall and use a specific term or phrase (e.g. "The ____ of boys to girls is 3 to 2."), sentence frames can also reinforce production of key academic language (e.g., "The ***ratio*** of... is shown in the diagram by...") and focus students on key mathematical ideas. For example, "I added... to the figure to show... " requires a creative response that encourages mathematical thinking about adding new features, such as auxiliary lines, to geometric visuals to help understand or solve a task. Sentence frames crafted for students with higher English proficiency levels can require sophisticated or lengthy responses. You can use a variety of sentence frames to accommodate a range of English proficiency levels, including at the same time to allow student choice. For example, you can post and use a combination of the following sentence starters and sentence frames to structure the reflection:

- I learned…
- It helped me when...
- I can change a geometric drawing by…
- Adding… to a geometric drawing can help me…
- The next time I have a geometry problem like this I will try... because...

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