

Curriculum Map

PhD Science Texas modules are sequenced to build coherent student understanding of science ideas. Each module provides opportunities for students to explore questions and apply knowledge and skills they developed in previous modules.

The curriculum maps provide an at-a-glance view of module titles, anchor phenomena, and Spotlight Lesson titles for each level.

LEVEL K	Title	Anchor Phenomenon	Spotlight Lessons Title	Spotlight Lessons Anchor Phenomenon
Module 1	▲ Weather	Cliff Dwellings at Mesa Verde	■ Magnets	Magnet Interactions in Games and Toys
Module 2	● Life	Life in the Mojave Desert		
Module 3	■ Light	Wayang Shadow Puppetry	▲ Sky	Bat Sightings in Austin, Texas

LEVEL 1	Title	Anchor Phenomenon	Spotlight Lessons Title	Spotlight Lessons Anchor Phenomenon
Module 1	■ Pushes and Pulls	Tugboats Moving Cargo Ships	▲ Weather Conditions	Changing Weather
Module 2	● Environments	Life in a Longleaf Pine Forest	▲ Water	Human Interactions with Water
Module 3	● Survival	Life at a Pond	▲ ■ Earth Materials	Creating Mata Ortiz Pottery

LEVEL 2	Title	Anchor Phenomenon	Spotlight Lessons Title	Spotlight Lessons Anchor Phenomenon
Module 1	■ Matter	Birds Building Nests	▲ Weather Events	1900 Galveston Hurricane
Module 2	■ Sound	The Recycled Orchestra of Cateura	▲ Objects in the Sky	Sea Turtle Hatchling Navigation
Module 3	● Plants	Plant Recovery Around Mount St. Helens	● Living Things and Their Environments	Life in Big Thicket National Preserve

▲ Earth and Space Science Focus

● Life Science Focus

■ Physical Science Focus

LEVEL 3	Title	Anchor Phenomenon	Spotlight Lessons Title	Spotlight Lessons Anchor Phenomenon
Module 1	▲ Earth Changes	The Transformation of Surtsey	■ Changes in Matter	Recycling
Module 2	● Survival and Change	Butterfly Survival		
Module 3	■ Forces and Motion	Motion in Space	▲ The Solar System	Solar Eclipse

LEVEL 4	Title	Anchor Phenomenon	Spotlight Lessons Title	Spotlight Lessons Anchor Phenomenon
Module 1	▲ Earth Features	Grand Canyon Features and Patterns	■ Mixtures and Solutions	Removing Pollution from Water
Module 2	■ Energy	Windmills at Work	▲ Earth and Space	Seasonal and Moon Phase Patterns
Module 3	● Plants in the Environment	Carnivorous Plants in Big Thicket National Preserve		

LEVEL 5	Title	Anchor Phenomenon	Spotlight Lessons Title	Spotlight Lessons Anchor Phenomenon
Module 1	▲ Earth Processes	Landscape of the Chihuahuan Desert	■ Physical Properties of Matter	Removing Pollution from the Environment
Module 2	● Ecosystems	Life Around a Mangrove Tree		
Module 3	▲ Sun, Earth, and Moon System	Views from Earth and Space	■ Forces, Motion, and Energy	Capstone Project: Light Rail Train System

▲ Earth and Space Science Focus ● Life Science Focus ■ Physical Science Focus

Anchor Visuals

PhD Science Texas uses recurring anchor visuals throughout each module to develop coherence, collect and display evidence of students' new knowledge, and help students integrate their new knowledge with their existing knowledge. Anchor visuals also make students' questions and thinking visible as students progress through each concept. Anchor visuals aid students in developing basic sight vocabulary, deriving meaning from environmental print, and in comprehending vocabulary and language structures used routinely in written classroom materials. Teachers should consider using students' own words when recording questions and related phenomena on the driving question board and when adding labels and explanations to the anchor model. Student language on anchor visuals may include everyday language and students' home language. As students learn new terminology throughout the module, teachers should update student language on the anchor visuals to identify connections between new terminology and concepts students previously described. The first module of Level 3, *Earth Changes*, is a transition module to Levels 3–5. Anchor visuals in this module more closely align with those in Kindergarten–Level 2 modules. As a class, students organize their learning in each module with a common set of three anchor visuals. Anchor visuals vary in Spotlight Lessons.

- **Driving question board:** a chart that drives learning from concept to concept by organizing phenomenon-based student questions and new student questions that arise through investigation
- **Anchor model:** a model that students develop to explain the anchor phenomenon and that students modify throughout the module as new learning emerges
- **Anchor chart:** a chart containing key scientific understandings that grows throughout the module as knowledge develops

The following tables summarize how teachers facilitate students' work with anchor visuals.

Driving Question Board

<p>Overview</p>	<p>The driving question board is a tool to organize student questions about the anchor phenomenon; it can increase student engagement and highlight connections between concepts as well as the enduring knowledge pursued by students. Teachers should consider using students' own words when recording questions and related phenomena on the driving question board. Student language on anchor visuals may include everyday language and students' home language. As students learn new terminology throughout the module, teachers should update student language on the anchor visuals to identify connections between new terminology and concepts students previously described.</p>
<p>How It Works (K–2)</p>	<ol style="list-style-type: none"> 1. After the introduction of the anchor phenomenon, students share questions about it or related phenomena. 2. The class posts unanswered questions in an Unanswered Questions area on the driving question board. 3. At the end of each concept, the class creates a new column to post answered questions related to the learning in that concept. Questions that are not associated with the learning in the concept or that are still unanswered remain in the Unanswered Questions area. 4. By the end of the module, many student questions are posted in a relevant column, while some are still unanswered.
<p>How It Works (3–5)</p>	<ol style="list-style-type: none"> 1. After the introduction of the anchor phenomenon, students share questions about it or related phenomena. 2. Students organize their questions into categories that form the module concepts on the driving question board. 3. Students review the driving question board during each concept to discuss which questions they can answer and which are still open. At any time, students may also add new questions and learning to the board.

Anchor Model

<p>Overview</p>	<p>The anchor model is a class model that students develop together throughout an entire module. By the end of a module, the anchor model should reflect students' explanation of the anchor phenomenon. Teachers should consider using students' own words when adding labels and explanations to the anchor model. Student language may include everyday language and students' home language. The anchor model should be displayed in the classroom so students can refer to and update it throughout the module. As students learn new terminology throughout the module, teachers should update student language to identify connections between the new terminology and concepts students previously described.</p>
<p>How It Works (K–2)</p>	<ol style="list-style-type: none"> 1. In Kindergarten, students work together to generate a class model that begins to explain the anchor phenomenon. In Levels 1 and 2, students first develop individual models that they use to generate the class model. 2. This class model is recorded in a large format (e.g., on chart paper or as a physical model) with students' input. 3. The class develops the anchor model throughout the module and periodically updates it by adding new evidence.

<p>How It Works (3–5)</p>	<ol style="list-style-type: none"> 1. Students use their individual models to generate a class model that begins to explain the anchor phenomenon. 2. This class model is recorded in a large format (e.g., on chart paper or an interactive whiteboard) with students' input. 3. The class develops the anchor model throughout the module and periodically updates it by adding new evidence.
--------------------------------------	--

Anchor Chart

<p>Overview</p>	<p>The anchor chart is a class summary of foundational learning that students develop together throughout an entire module. The anchor chart should be displayed in the classroom so students can refer to and update it throughout the module.</p>
<p>How It Works (K–2)</p>	<ol style="list-style-type: none"> 1. The teacher writes the title for the anchor chart on a sentence strip. 2. As students distill key science concepts from their learning throughout the module, the teacher uses student input to record a summary of these concepts on sentence strips. The sentence strips are placed in a pocket chart or affixed to a wall or whiteboard so they are easy to move. 3. When applicable, the sentence strips from the anchor chart can be placed next to learning recorded on the anchor model and other class work products. This placement will help students make connections between key science concepts and students' classroom learning. After the activity or lesson, the sentence strips should be placed back on the anchor chart. 4. The anchor chart is posted in a central location where it can be referred to during applicable lessons and activities.
<p>How It Works (3–5)</p>	<ol style="list-style-type: none"> 1. The teacher writes the title for the anchor chart on a large sheet of chart paper. 2. As students distill the key concepts from their learning, the teacher adds information via student input as appropriate. 3. The anchor chart is posted in a central location where it can be referred to during applicable lessons and activities.

Implementation and Instructional Resources

Supporting Scientific Discourse

CLASSROOM EXPECTATIONS

Scientific discourse is integral to the curriculum and requires a classroom environment where all students productively share their ideas and questions, whether in the classroom or in a remote setting. As students make sense of phenomena, they develop science ideas along with their investigation and reasoning skills. During every step of their learning, students must have the opportunity to process information. When students clarify, justify, and interpret their ideas through discussion, they deepen their reasoning. Students practice investigation and reasoning skills as they gather evidence and make sense of phenomena. Discourse is the sense-making tool students use to put the pieces of evidence together to develop scientific understanding.

During science discussions, teachers should remind students of classroom expectations for discourse as follows.

Collaboration

- Actively and effectively participate in discussions and collaborations, building on the ideas of others and clearly communicating their own ideas.
- Listen actively to interpret verbal and nonverbal messages, ask relevant questions, and make pertinent comments.
- Evaluate information from various media presented in different formats.
- Work collaboratively with others to develop a plan of shared responsibilities and rules for discussion.

Presentation of Information and Ideas

- Present information and results in an organized presentation employing eye contact, speaking rate, volume, enunciation, natural gestures, and conventions of language to communicate ideas effectively.
- Use digital media and display data visually to aid in the understanding of presentations.

COLLABORATIVE CONVERSATION PROMPTS

During classroom conversations, use prompts such as the following to support students' discourse. Encourage students to ask similar questions of their peers.

Clarification

- What do you mean by _____?
- Can you say more about that?
- Could you summarize that in your own words?
- What is your main point?
- Could you describe what difference that makes?

Reasoning

- Why do you think that?
- How did you come to that conclusion?
- What do you think caused that?
- If what you said is true, then how do you explain _____?
- What is an alternative to _____?

Evidence

- What is your evidence?
- Could you give us an example?
- What observations or data support your thinking?
- How do you know?

Collaboration

- Who can summarize what _____ just said?
- Who can build on that idea?
- Do you agree with _____? Disagree with _____?
- Did _____ change your mind, or are you sticking with your original answer?
- Does anyone see this another way?
- How are these two ideas alike? How are they different?

LEVELED SCIENTIFIC DISCOURSE SUPPORTS

During scientific discourse, use the following sentence frames to differentiate supports for language learners. Sentence frames within these lists increase in linguistic demand from first to last. For beginning language learners, consider selecting one or two frames and modeling their use one-on-one or within a small group.

Observe/Describe

- I see _____.
- I notice _____.
- This model shows _____.
- I observed _____, when _____.
- My observation is that _____ because _____.

Compare/Contrast

- ____ is like ____.
- ____ is different from ____.
- One similarity/difference between ____ and ____ is ____.
- ____ and ____ are similar because they both ____.
- ____ and ____ are different because while ____ has ____, ____ has _____.

Analyze Data

- I see ____.
- I notice ____.
- A pattern I see is ____.
- We can interpret ____ as ____.
- ____ and ____ are connected by ____.

Explain

- I think ____.
- This may have happened because ____.
- Based on ____, I think ____.
- After observing ____, I infer/conclude ____.

Categorize/Classify

- I arranged ____ by ____.
- I classified ____ by ____.
- ____ consists of ____ categories.
- We can classify ____ according ____.
- These ____ are arranged according to ____.
- ____ and ____ are types of ____ because ____.
- ____ and ____ go together because they both (all) have ____.
- ____ and ____ do not go together because ____.

For additional reading on science discussions in the classroom, see the NSTA article “Making Time for Science Talk” by Mark J. Gagnon and Sandra K. Abell (2007) (<http://phdsci.link/1148>) or *Talk Science Primer* by Sarah Michaels and Cathy O’Connor (2012) (<http://phdsci.link/1149>).

Instructional Routines

An instructional routine is a classroom procedure that supports the development of content knowledge and academic skills in an engaging, developmentally appropriate, and active way. An instructional routine provides students with a structured approach to thinking about a topic, question, or idea while often getting them moving and interacting with each other. The routines suggested in *PhD Science Texas* lessons help students think about science in different ways to build content knowledge, deepen understanding, and develop critical thinking skills. Instructional routines increase student engagement and provide practices that make students' thinking and learning visible.

The following tables describe routines that appear frequently in *PhD Science Texas* lessons. They are organized by the main purpose of the routine. Although the Teacher Edition provides examples of how to use routines, teachers should use their expertise to select routines that meet students' needs for each lesson's tasks. These routines can be used for all levels of English learners: beginning, intermediate, advanced, or advanced-high. Teachers can modify to meet students' proficiency levels. See the leveled tables for suggested modifications.

COLLABORATIVE CONVERSATION ROUTINES AND TECHNIQUES

Fishbowl

Purpose	The Fishbowl routine allows students to model or practice behaviors such as asking thoughtful questions, listening attentively, and sharing ideas or tasks.
Grouping	Class
How It Works	<ol style="list-style-type: none"> 1. The teacher directs students to focus their observations and learning on something specific, which will be the purpose of the Fishbowl. 2. The class is divided into two groups: inside or outside the fishbowl. Outside students sit in a circle around inside students. Typically, more students are outside the fishbowl than in it. 3. The teacher provides additional information or directions to those in the fishbowl as needed. 4. Students inside the fishbowl engage in a collaborative task or discussion, while students outside observe. 5. Students debrief through discussion and/or writing.

Inside–Outside Circles

Purpose	The Inside–Outside Circles routine allows students to respond to questions or talk about information with a variety of other students in a structured manner.
Grouping	Class and then pairs
How It Works	<ol style="list-style-type: none"> 1. The class is divided in half. One half becomes the inside circle, and the other half forms the outside circle to create two concentric circles. 2. Students in the inside circle face students in the outside circle. 3. Students receive a topic or a question, or students prepare a question related to a concept. 4. Students in each pair (one student in the inside circle and one student in the outside circle) take turns answering the question or discussing the topic. 5. When they finish sharing, one circle rotates so students face new partners for a new question or topic.

Mix and Mingle

Purpose	The Mix and Mingle routine offers an active way for students to share ideas about a text or concept orally.
Grouping	Class and then pairs
How It Works	<ol style="list-style-type: none"> 1. Students receive a topic or a question, or students prepare a question related to a concept. 2. Students circulate and then pair up with a peer and share their responses. 3. Students circulate to stand with a different peer and then discuss responses to the same question or a new question. <p>Optional: Cues such as music or chanting can tell students when to stop circulating and pair up. Students may stand back-to-back with a partner, think about the question, and then turn to face their partner and discuss.</p>

Question Corners

Purpose	The Question Corners routine allows students to express and support their claims.
Grouping	Groups and then class
How It Works	<ol style="list-style-type: none"> 1. Students receive a debatable statement or question. 2. A response or opinion is posted in each corner of the classroom. Students move to the corner that best represents their opinion. 3. Students discuss the reasons they chose their corner. 4. After listening to one another’s reasoning, students have the option of moving to another corner, but they must explain their rationale for moving.

Response Techniques

Purpose	Response Techniques encourage class engagement while enabling the teacher to conduct quick, formative assessments of student understanding.
Grouping	Class
How It Works	<p>Pose a question, and then use a technique such as one of the following to elicit quick responses from a variety of students.</p> <ul style="list-style-type: none"> ▪ Equity sticks (recommended for open-ended questions): Randomly select a student's name from a container that holds all students' names on slips of paper or craft sticks. ▪ Response cards (recommended for questions with a closed set of possible responses): Have students select a response from a set of preprinted response cards, and ask them to hold up their cards for the class to see. ▪ Nonverbal signal (recommended for questions with a closed set of possible responses): Ask students to respond with a general signal (e.g., the American Sign Language [ASL] sign for yes or no) or a situation-specific signal (e.g., the ASL letter <i>P</i> when they hear details about a story's problem). To promote independent thinking, have students make the signals close to their chest. ▪ Whiteboards (recommended for open-ended or closed questions with short written responses): Have students write responses on individual whiteboards or other erasable boards, and then ask them to hold up their responses for the class to see.

Socratic Seminar

Purpose	A Socratic Seminar is a student-led academic conversation. This routine allows students to use their speaking and listening skills to express and deepen their science content knowledge.
Grouping	Class
How It Works	<ol style="list-style-type: none"> 1. Students prepare for dialogue by reviewing and reflecting on relevant materials or texts. 2. Students engage in prewriting to stimulate and organize thinking about a topic. 3. Students receive an opening question. 4. Students form a dialogue circle and engage in collaborative speaking and listening by using evidence from their resources. 5. Students receive prompts as needed to stimulate the dialogue. 6. Students complete a postwriting activity to answer questions such as these: What new knowledge did you gain? How did your thinking change? 7. Students debrief the activity, reflecting on what went well and what needs improvement.

Think–Pair–Share

Purpose	Think–Pair–Share allows individual students to consider their thoughts about a question and then collaboratively discuss the question with peers.
Grouping	Individuals, pairs, and then groups or class
How It Works	<ol style="list-style-type: none"> 1. Students receive a question. 2. Students have a few minutes to think about the question. 3. Students share their thoughts with a partner. 4. Pairs share their thoughts with groups or the class. Not all students need to share in the larger group. <p>Variations</p> <ul style="list-style-type: none"> ▪ Think–Pair: Students complete the same procedure without the group or class sharing. ▪ Think–Pair–Square: Students conduct a Think–Pair and then join a second pair, sharing in groups of four. ▪ Jot–Pair–Share: Students quickly jot down their thinking before sharing with a partner.

Value Lineup

Purpose	Value Lineup encourages students to organize and deepen their thinking about essential concepts as they demonstrate agreement or disagreement with a posed statement or point of view and expand their understanding by listening to classmates’ beliefs.
Grouping	Class and then pairs
How It Works	<ol style="list-style-type: none"> 1. The teacher reads aloud a statement related to a module idea or concept. 2. Students line up according to their level of agreement or disagreement with the statement. 3. Students fold the line in the middle and pair up so that students who most disagree are partnered with those who most agree. 4. Partners discuss their individual positions.

Vote–Discuss–Revote

Purpose	A formative assessment tool, Vote–Discuss–Revote tracks students’ thinking throughout a lesson or module through the use of voting, student-driven discussion, and then reevaluation of the initial vote.
Grouping	Individuals, pairs, groups, and then class
How It Works	<ol style="list-style-type: none"> 1. Students receive a question along with a small set of possible answers (three to six) related to a topic of study, including multiple answers that are partially correct or reflect common student misconceptions. One answer should be the most accurate choice. 2. Students first vote individually and anonymously on a sticky note (or with polling technology). These votes are collected and recorded publicly. 3. Students discuss their answers with a partner and then potentially with a group before deciding whether to change their votes after hearing the arguments of others. <p>This routine may be completed in one class period, or the routine may be repeated in a subsequent class period after students have investigated the concept further.</p>

Whip Around

Purpose	The Whip Around routine serves as a quick check for understanding of each student’s thinking or as a culminating reflection on learning.
Grouping	Class
How It Works	<ol style="list-style-type: none"> 1. Students receive an open-ended question. 2. Students jot down or think about their answers individually. 3. Students share their responses one after another until all students have shared their answers. 4. If students have written their answers, they can strike out answers that someone else says first.

LEVELED COLLABORATIVE CONVERSATION ROUTINES AND TECHNIQUES

Instructional Routine	Beginner	Intermediate	Advanced/ Advanced-High
Fishbowl	Provide sentence frames and model use for students to fill in with simple terms.	Provide a word bank of key terms to help students respond to tasks.	Follow the routine as written.
Inside–Outside Circles	Allow students to respond with yes/no or one- or two-word responses.	Supply sentence frames related to the topic for students to interact with a partner.	Follow the routine as written.

Instructional Routine	Beginner	Intermediate	Advanced/ Advanced-High
Mix and Mingle	Read aloud the prompt. Allow students to respond with yes/no or one- or two-word responses.	Read aloud the prompt. Supply sentence frames related to the prompt for students to interact with a partner.	Follow the routine as written.
Question Corners	Read aloud the prompt and response/opinion. Supply sentence frames such as “I think ____ because ____” and model their use for partner interaction.	Read aloud the prompt and response/opinion. Provide a word bank for students to draw terminology from during partner interaction.	Follow the routine as written.
Response Techniques	Follow the routine as written. Consider using appropriate scaffolds for each technique.	Follow the routine as written. Consider using appropriate scaffolds for each technique.	Follow the routine as written.
Socratic Seminar	Instruct students how to use scaffolded sentence frames and a word bank of key terms to help them share ideas.	Allow students to use scaffolded sentence frames to help them build on one another’s remarks.	Follow the routine as written.
Think-Pair-Share	Provide sentence frames and model their use.	Provide a word bank related to the topic for students to draw terminology from.	Follow the routine as written.
Value Lineup	Provide sentence frames and model their use.	Supply a word bank related to the concept for students to draw terminology from.	Follow the routine as written.
Vote-Discuss-Revote	Read aloud the question and answers. Provide support for the way students vote, and allow simple terms or symbols for <i>for</i> or <i>against</i> .	Read aloud the question and answers. Use sentence frames or a word bank to provide support for the way students vote.	Follow the routine as written.
Whip Around	Allow students to quick sketch to represent their response.	Allow students to quick sketch and add labels to represent their response.	Follow the routine as written.

WRITTEN RESPONSE ROUTINES

Chalk Talk

Purpose	Chalk Talk is a silent conversation that helps students organize their thinking and fosters universal participation.
Grouping	Groups or class
How It Works	<ol style="list-style-type: none"> 1. Questions are written on the board or on sheets of chart paper. 2. Students respond to the questions, as well as to others' follow-up questions and responses, by writing directly under each question on the board or paper.

Gallery Walk

Purpose	Gallery Walk deepens engagement and understanding by allowing students to share their work with peers in a gallery setting.
Grouping	Individuals, pairs, or groups
How It Works	<ol style="list-style-type: none"> 1. Work is posted around the room. The work can be group investigation plans, group Graffiti Walls (see Graffiti Wall section), group models, or other work. 2. Students circulate, closely viewing the work. They write their observations or discuss them with peers. (Optional: Some students stand beside their own work, acting as docents to present it to viewers.) 3. Students debrief through discussion and/or writing.

Give One–Get One–Move On

Purpose	Give One–Get One–Move On engages all students in identifying and sharing key learning.
Grouping	Pairs
How It Works	<ol style="list-style-type: none"> 1. Students record key ideas on index cards or sticky notes. 2. Students locate a partner and share their key ideas. 3. The announcement “Give One” tells students to swap ideas and “Get One” from another student. 4. The announcement “Move On” tells students to circulate again to find a new partner and explain the new idea to the new partner.

Graffiti Wall

Purpose	Graffiti Wall helps students organize and deepen their thinking as they collaboratively explore key concepts. This routine supports visual learners and promotes collective learning.
Grouping	Groups
How It Works	<ol style="list-style-type: none"> 1. Groups receive a sheet of chart paper. 2. After investigating, reading, or discussing a task, students record their ideas and learning on the paper through symbols, illustrations, words or phrases, and quotations. Scaffolds may take the form of specifying a minimum or maximum number of symbols or phrases for students to record on the wall.

Quick Write

Purpose	Quick Write is a brief written response that helps students reflect on a topic and allows teachers to assess comprehension. It can be used at the beginning of a lesson as a warm-up, during the middle of a lesson in response to an idea or experience, or at the end of a lesson to summarize key ideas.
Grouping	Individuals
How It Works	<ol style="list-style-type: none"> 1. The teacher chooses a purpose for the writing that is tied to the content area. 2. The teacher reads a prompt aloud to students. 3. Students have a short amount of time to jot down whatever comes to mind in response. 4. Students share their response with others, or the teacher collects students' responses to inform teaching.

Snowball

Purpose	The Snowball routine allows students to predict, summarize, justify, explain, or practice critical thinking in response to a content-related question or prompt. This routine provides a low-risk engagement opportunity for students because responses are anonymous.
Grouping	Class
How It Works	<ol style="list-style-type: none"> 1. Students anonymously write a response or answer to a prompt or question on a piece of paper. 2. Students crumple the paper into a "snowball." 3. Students throw their snowballs across the room for a short time. 4. After students have thrown several snowballs, they select the one closest to them and prepare to share the response on the paper with the class.

Stop and Jot

Purpose	Stop and Jot allows individual written responses to texts or learning. This procedure provides ongoing assessment data for teachers and helps students track their thinking.
Grouping	Individuals and then pairs or class
How It Works	<ol style="list-style-type: none"> 1. An oral cue or a visual symbol (e.g., stop sign, response box) prompts students to pause and respond to a question during a task. 2. Students write a brief response. 3. Students briefly discuss their responses with a partner and/or the whole class. 4. Students can refer to their Stop and Jots when completing formative assessments. <p>Variation</p> <p>Stop and Draw: Rather than writing, younger students draw a quick sketch to represent their responses.</p>

LEVELED WRITTEN RESPONSE ROUTINES

Instructional Routine	Beginner	Intermediate	Advanced/ Advanced-High
Chalk Talk	Allow students to quick sketch to represent their response.	Allow students to quick sketch and add labels to represent their response.	Follow the routine as written.
Gallery Walk	Consider allowing students to verbally reply to work with yes/no or one- or two-word responses.	Provide a word bank for students to use during conversations or writing.	Follow the routine as written.
Give One-Get One-Move On	Allow students to quick sketch to represent their response.	Allow students to quick sketch and add labels to represent their response.	Follow the routine as written.
Graffiti Wall	Scaffolds may take the form of specifying a minimum or maximum number of symbols or phrases for students to record on the wall. Consider allowing students to record ideas and learning in their home language.	Scaffolds may take the form of specifying a minimum or maximum number of symbols or phrases for students to record on the wall.	Follow the routine as written.
Quick Write	Provide students with a word bank with related terminology.	Allow students to use basic sentence structure and basic academic language.	Follow the routine as written.

Instructional Routine	Beginner	Intermediate	Advanced/ Advanced-High
Snowball	Allow students to quick sketch to represent their response.	Allow students to quick sketch and add labels to represent their response.	Follow the routine as written.
Stop and Jot	Allow students to quick sketch to represent their response.	Allow students to quick sketch and add labels to represent their response.	Follow the routine as written.

TERMINOLOGY LEARNING ROUTINES

Act It Out

Purpose	The Act It Out routine provides students with a kinesthetic outlet to connect movement with an unfamiliar term to remember its meaning.
Grouping	Individuals or pairs and then groups
How It Works	<ol style="list-style-type: none"> 1. Students receive a term, individually or in pairs, that has been introduced in a lesson but may still be unfamiliar. 2. Students have 1 or 2 minutes to imagine how they might add movement to the term to help convey its meaning. 3. Students then take turns acting out their terms in groups.

Concept Map

Purpose	A concept map allows students to determine connections between multiple related terms.
Grouping	Individuals, pairs, or groups
How It Works	<ol style="list-style-type: none"> 1. Students receive a set of related terms. 2. Students determine connections between the terms. 3. Students create a graphic organizer to represent the terms' relationships. The shape varies depending on the word relationships (e.g., Venn diagram, spoke wheel, flowchart).

Frayer Model

Purpose	A Frayer model helps students identify and define unfamiliar concepts and terms by looking at essential characteristics, examples, and nonexamples.
Grouping	Individuals, pairs, or groups
How It Works	<ol style="list-style-type: none"> 1. A concept or term is selected for further study. 2. Students record the characteristics, examples, and nonexamples of the concept or term to create a working description or definition. <p>As an extension activity, students can sketch their examples and nonexamples.</p>

Images

Purpose	Images support the acquisition and understanding of scientific terms.
Grouping	Class
How It Works	<ol style="list-style-type: none"> 1. Select an image for students to view that represents the desired scientific term of study. Images can include photographs, diagrams, and illustrations. 2. Students label parts within the image and/or add annotations showing additional information or connections. 3. Students discuss what the image represents.

Link Up

Purpose	Link Up helps students understand the connection between two identified scientific terms.
Grouping	Pairs and then class
How It Works	<ol style="list-style-type: none"> 1. Each student receives a card with a scientific term on it. 2. (Optional) A demonstration of the routine helps students understand relationships that different terms may have to each other. 3. Students circulate and discuss with each person they meet whether their terms are related. 4. When students identify someone with a related term, they pair with that person. 5. As a class, students debrief. For example, pairs share the relationship between their terms.

Logical Analogies

<p>Purpose</p>	<p>Logical analogies help students find connections between concepts or ideas by making analogies.</p>
<p>Grouping</p>	<p>Individuals, pairs, or groups</p>
<p>How It Works</p>	<ol style="list-style-type: none"> 1. Students receive a prompt (older students may come up with their own analogies independently) to complete related to a concept. 2. Students finish the analogy and share with classmates. <p>Example A</p> <p>Veins are to _____ like _____ is/are to _____ .</p> <p>Veins are to <u>blood</u> like <u>roads</u> are to <u>cars</u>. Most of the time everything moves smoothly, but sometimes they can get blocked.</p> <p>Example B</p> <p>Our nervous system is like _____.</p> <p>Our nervous system is like <u>a tree with many branches</u>.</p>

Morpheme Matrix

Purpose	A morpheme matrix deepens students’ knowledge of roots and affixes. Use it to introduce a new term or to build on a known root.																		
Grouping	Individuals, pairs, or groups																		
How It Works	<ol style="list-style-type: none"> 1. A term is introduced, and students are encouraged to break the term down to its root(s) and affix(es). 2. The teacher identifies the meaning of the root(s) and/or affix(es). 3. Students brainstorm additional words that have the same root. Students create a morpheme matrix showing related words. 4. Students discuss the meaning of new terms and use them in different contexts. <p>Example: <i>reconstruct</i></p> <table border="1" data-bbox="446 693 1393 1312"> <tr> <td data-bbox="446 693 597 892">re de</td> <td data-bbox="597 693 748 892">con</td> <td data-bbox="748 693 1052 1312" rowspan="3" style="text-align: center;">struct “build”</td> <td colspan="2" data-bbox="1052 693 1393 892">s ed ing ion or</td> </tr> <tr> <td data-bbox="446 892 597 1035">in</td> <td data-bbox="597 892 748 1035">de</td> <td data-bbox="1052 892 1227 1035">ive</td> <td data-bbox="1227 892 1393 1035">ly ity ness</td> </tr> <tr> <td colspan="2" data-bbox="446 1035 748 1312">in ob sub super infra</td> <td data-bbox="1052 1035 1227 1312">ure</td> <td data-bbox="1227 1035 1305 1178">es ed ing</td> <td data-bbox="1305 1035 1393 1312">al ly ism ist</td> </tr> </table>					re de	con	struct “build”	s ed ing ion or		in	de	ive	ly ity ness	in ob sub super infra		ure	es ed ing	al ly ism ist
re de	con	struct “build”	s ed ing ion or																
in	de		ive	ly ity ness															
in ob sub super infra			ure	es ed ing	al ly ism ist														

Outside-In

Purpose	The Outside-In routine helps students determine word meaning from context and morphology such as roots and prefixes.
Grouping	Individuals, pairs, groups, or class
How It Works	<ol style="list-style-type: none"> 1. Students are presented with an unfamiliar word from a text. 2. Students discuss clues outside the word (context) that reveal the word’s possible meaning. 3. Students discuss what clues inside the word (e.g., roots, affixes) reveal about the word’s possible meaning. 4. Students draft possible definitions and then use reference materials to verify them.

Signal Unknown Words

Purpose	Students signal unknown words to build their understanding of scientific terminology.
Grouping	Pairs or individuals
How It Works	Students identify and annotate or record unknown words in a text, prioritizing those that are critical to their understanding of concepts.

LEVELED TERMINOLOGY LEARNING ROUTINES

Instructional Routine	Beginner	Intermediate	Advanced/ Advanced-High
Act It Out	Model the routine for the class. Allow groups to help students think of ways to act out the term together.	Follow the routine as written.	Follow the routine as written.
Concept Map	Allow students to work with a partner and verbally discuss the relationship, and then provide students with a graphic organizer to fill in collaboratively.	Provide students with a graphic organizer to fill in.	Follow the routine as written.
Frayer Model	Allow students to draw images to support their understanding of the term. To support students with nonexamples, consider providing a word bank or images that represent the nonexample.	Provide sentence frames for students to use to complete the Frayer model matrix.	Follow the routine as written.
Images	Provide a word bank to help with labeling and annotating. Group related words together. Allow students to share with a partner before whole class discussion.	Allow students to share with a partner before whole class discussion.	Follow the routine as written.

Instructional Routine	Beginner	Intermediate	Advanced/ Advanced-High
Link Up	Demonstrate the routine with the whole class. Consider having students practice with familiar terms, and highlight connections between these familiar words to help students understand the different ways terms can be related.	Demonstrate the routine with the whole class. Provide students with a question bank to help them determine related terms.	Follow the routine as written.
Logical Analogies	Follow example A of the routine. Consider providing a word bank with simple pictures to further support students.	Follow example B of the routine.	Follow the routine as written.
Morpheme Matrix	Provide a partially filled in matrix.	Provide a bank of root(s) and affix(es).	Follow the routine as written.
Outside-In	Provide a visual or other context for students to use to determine a definition. Allow students to share verbally.	Allow students to verbally share a possible definition.	Follow the routine as written.

TEXT-BASED ROUTINES

Choral Reading

Purpose	Choral reading supports fluency and comprehension of a challenging text.
Grouping	Class
How It Works	<ol style="list-style-type: none"> 1. Students receive copies of a text, or an enlarged version of the text is projected at the front of the classroom. 2. The teacher reads the text aloud to model fluent reading. Students follow along with the text. They may place a piece of paper or an index card under each line to help them focus and keep their place. 3. The teacher rereads the text as all students read the text aloud in unison.

Jigsaw

<p>Purpose</p>	<p>The Jigsaw routine allows students to study one section of a text and then share with students who studied other sections. This strategy gives all students access to the ideas from the full text without requiring them to read the entire text. It also encourages collaborative learning.</p>
<p>Grouping</p>	<p>Groups</p>
<p>How It Works</p>	<ol style="list-style-type: none"> 1. A text is divided into sections. 2. Students form home groups with each student in a home group assigned a specific section of the text. 3. Students regroup according to their assignment from step 2, forming “expert” groups with others who share the same assignment. 4. Students work collaboratively in their expert groups to become experts on their assigned text. 5. Students then return to their home groups. One by one, group members share their expertise. <p>Variation</p> <p>One Stays, Three Stray: Home groups meet, and group members become experts on their assigned section. One group member stays behind to present their expert findings. The other three group members stray to join with other groups’ experts who stayed and hear their expert findings. All students return to their home group and report what they learned.</p>

Partner Reading

<p>Purpose</p>	<p>Partner reading is a cooperative activity that encourages peer-to-peer learning. It is a routine for fluency practice only when students have previously read the text.</p>
<p>Grouping</p>	<p>Pairs</p>
<p>How It Works</p>	<p>Option 1</p> <ol style="list-style-type: none"> 1. Partner A reads the assigned passage while Partner B listens and comments on a specified aspect of the reading (e.g., accuracy or fluency). 2. Partner B reads the same passage while Partner A listens and comments. <p>Option 2</p> <ol style="list-style-type: none"> 1. Partner A reads a page, paragraph, or section. 2. Partner B reads a different page, paragraph, or section. 3. Each partner shares feedback after hearing the other read.

Save the Last Word

Purpose	The Save the Last Word routine helps students clarify and deepen their thinking about a text, quote, or idea while encouraging active speaking and listening skills. (Adapted from “The Final Word” by Jennifer Fischer-Mueller and Gene Thompson-Grove [2017].)
Grouping	Groups
How It Works	<ol style="list-style-type: none"> 1. Students receive a quote, text, video clip, or other media that serves as the catalyst for this activity. 2. Students read/view the selection. 3. Students record three ideas or sentences that stood out to them on the front of an index card. On the back of the card, students write a brief explanation of why they selected those ideas (e.g., what the ideas mean to them or remind them of). 4. Working in groups of three, Student A reads one or more of the ideas on the front of the card. Students B and C discuss why those ideas might be important. Then Student A reads the back of the card to explain the reason for selecting the idea and thus has the “last word.”

LEVELED TEXT-BASED ROUTINES

Instructional Routine	Beginner	Intermediate	Advanced/ Advanced-High
Choral Reading	Follow the routine as written.	Follow the routine as written.	Follow the routine as written.
Jigsaw	Allow students to work with a partner to read the text, and then provide and model sentence frames to help students teach the home group.	Provide a smaller section of text, and provide sentence frames to help students teach the home group.	Follow the routine as written.
Partner Reading	Have paired groups choral read short passages and share simple responses.	Allow students to be Partner B and follow Option 1 protocol.	Follow the routine as written.
Save the Last Word	Allow students to draw pictures to record ideas.	Allow students to write short sentences or a few words to capture their ideas.	Follow the routine as written.