NGSS Science and Engineering Practices with Corresponding ELD Standards

3rd Grade

1. Asking questions and defining problems

Students will inquire, identify, predict, describe, and define
- Ask questions about what would happen if a variable is changed.
- Identify scientific (testable) and non-scientific (non-testable) questions.
- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
- Use prior knowledge to describe problems that can be solved.
- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.   (NGSS Appendix F)

General Strategies for All Students

- ☐ Provide an engaging context that peaks student curiosity (discrepant event, interesting scenario, hands-on activity, relevant situation, authentic problem)
- ☐ Keep class chart for student questions and/or students record questions in their science notebooks.
- ☐ Encourage student to use the crosscutting concepts to formulate questions, e.g. *Is there a pattern? What is the cause of this effect? How does this system work? What is the function of this structure?* (See a complete list at http://crosscutsymbols.weebly.com/)
- ☐ Recast students' incomplete or flawed questions, *So what you're asking is…? You're question then is …?*
- ☐ Brainstorm with students a list of questions based on a shared experience and then together sort them into "testable" and "non-testable" questions.

Corresponding ELD Standards

Part 1. Interacting in Meaningful Ways: A. Collaborative: 1. Exchanging information/ideas;
B. Interpretive: 5. Listening actively

Emerging	Expanding	Bridging
P1.A.1 Contribute to conversations and express ideas by asking *yes-no* and *wh-* questions.	P1.A.1 Contribute to class, group, and partner discussions, including sustained dialogue, by asking relevant questions.	P1.A.1 Contribute to class, group, and partner discussions, including sustained dialogue, by asking relevant questions.
P1.B.5 Demonstrate active listening to read-alouds and oral presentations by asking and answering basic questions, with prompting and substantial support.	P1.B.5 Demonstrate active listening of read-alouds and oral presentations by asking and answering detailed questions, with occasional prompting and moderate support.	P1.B.5 Demonstrate active listening of read-alouds and oral presentations by asking and answering detailed questions, with minimal prompting and light support.

3rd Grade NGSS Science and Engineering Practices with Corresponding ELD standards

Emerging	Expanding and Bridging
Sentence frames: *What is ..?* *What does ..?,* *Where is ...?* *When I ... why does...?* *When does ... ?* *How does ..?* *Why is ..?* *Why does...?* *I predict ...* **Questions/Prompts:** *Which of these questions are you wondering about?* *Which variable do you want to change?* *Could ... be the problem?* *Is ... a criterion?* *Could ... be a constraint?*	**Sentence frames:** *I wonder...* *What would happen if...?* *What causes...?* *What are the effects of...?* *How does ... affect ...?* *What would change if ...?* *I predict ... because ...* *The problem we will solve is ...* *Based on what I know about ..., I think ...* **Questions/Prompts:** *What questions do you have about...?* *What questions do you have about the variables?* *What questions could you ask to find out...?* *What would be an alternative question?* *What is the problem we are trying to solve?* *What are the criteria? What are the constraints?*

2. Developing and using models

Students develop, represent, predict, describe, explain, revise, and test
- Identify limitations of models
- Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.
- Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.
- Develop and/or use models to describe and/or predict phenomena.
- Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.
- Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.   (NGSS Appendix F)

General Strategies for All Students

☐ Model for students how to develop and use models to explain their thinking.
☐ Regularly have students draw a model to use as an artifact for discussion. Encourage students to revise their models based on new information.
☐ Provide supports for students to share their models and ask each other questions in pairs or small groups:

Student A. What does your model show/predict/explain?
Student B. My model shows/predicts/explains…
Student A. What does … mean?
Student B. It shows …

Corresponding ELD Standards

Part 1. Interacting in Meaningful Ways: A. Collaborative: 2. Interacting via written English;
C. Productive 9. Presenting

Emerging	Expanding	Bridging
P1.A.2 Collaborate with peers on joint writing projects of short informational texts, using technology where appropriate for publishing, graphics, etc.	P1.A.2 Collaborate with peers on joint writing projects of longer informational texts, using technology where appropriate for publishing, graphics, etc.	P1.A.2 Collaborate with peers on joint writing projects of a variety of longer informational texts, using technology where appropriate for publishing, graphics, etc.
P1.C.9 Plan and deliver very brief oral presentations (e.g., describing an organism).	P1.C.9 Plan and deliver brief oral presentations (e.g., explaining a science process).	P1.C.9 Plan and deliver longer oral presentations (e.g., explaining a science process).

Emerging	Expanding and Bridging
Sentence frames: *The model shows/explains/predicts …* *The model doesn't explain …* *The parts of my model are …* **Questions/Prompts:** *Make a drawing in your notebook to explain …* *What could you add to you model to show…?* *Does this part mean …?*	**Sentence frames:** *I revised my model based on …* *My model shows how … affects …* **Questions:** *What does the model explain? What doesn't it explain?* *What is the relationship between … and …?* *What ideas could you add to your model?* *What changes could you make?*

3. Planning and carrying out investigations

Students design, sequence, predict, evaluate, describe, organize, compare, classify, draw, label
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
- Evaluate appropriate methods and/or tools for collecting data.
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
- Make predictions about what would happen if a variable changes.
- Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.   (NGSS Appendix F)

General Strategies for all Students
☐ Model the process for planning an investigation.
☐ Teach a mini-lesson on ways to record and organize data in student science notebooks (e.g., T-charts, lists, technical drawings, labeling)
☐ Introduce equipment and procedural words beforehand (*separate, pour, measure, etc.)* and post on a class word wall or chart with images.
☐ After coming to a class or group consensus on a procedure for an investigation, document the steps on the board with illustrations so that all students have access to them.
☐ Have students work in small groups. Encourage and make collaboration a focus.

Corresponding ELD Standards
Part 1. Interacting in Meaningful Ways   A. Collaborative: 1. Exchanging information/ideas;
C. Productive 10. Writing

Emerging	Expanding	Bridging
P1.A.1 Contribute to conversations and express ideas by asking and answering *yes-no* and *wh-* questions and responding using short phrases.	P1.A.1 Contribute to class, group, and partner discussions, including sustained dialogue, by following turn-taking rules, asking relevant questions, affirming others, and adding relevant information.	P1.A.1 Contribute to class, group, and partner discussions, including sustained dialogue, by following turn-taking rules, asking relevant questions, affirming others, adding relevant information, building on responses, and providing useful feedback.
P1.C.10 (b) Paraphrase text and recount experiences using key words from notes or graphic organizers.	P1.C.10 (b) Paraphrase texts and recount experiences using complete sentences and key words from notes or graphic organizers.	P1.C.10 (b) Paraphrase texts and recount experiences using increasingly detailed complete sentences and key words from notes or graphic organizers.

Emerging	Expanding and Bridging
Sentence frames: *First, we will …* *Next, we will …* *Then, we will …* *If we change … then ….* *I predict … because …* *I observe …*	**Sentence frames:** *Based on what we know about … we predict …* *If we … we expect …*
Questions/Prompts: *Are you trying to find out if…?* *Have you considered …?* *What will you do first? Second?* *Will you need …?* *Is this the variable you will control?* *Does … meet the criteria?*	**Questions/Prompts:** *What are you trying to find out?* *How could you find out…?* *Is there another way?* *What materials will you need?* *How could you determine …?* *Which variables are controlled?* *How will you test …?* *How will you know if … meets the criteria?*

4. Analyzing and interpreting data

Students compare, represent, classify, sequence, analyze
- Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.
- Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.
- Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.
- Analyze data to refine a problem statement or the design of a proposed object, tool, or process.
- Use data to evaluate and refine design solutions.   (NGSS Appendix F)

Strategies for All Students
☐ Model ways of organizing data in class charts and student science notebooks (graphs, charts, Venn Diagrams, graphic organizers)
☐ Provide sentence frames for oral and written discourse.
☐ Chart the data from each group on a class chart for students to analyze.

Corresponding ELD Standards
Part 1. Interacting in Meaningful Ways B. Interpretive 6. Reading/Viewing closely;
Part 2. Learning about How English Works A. Structuring Cohesive Text

Emerging	Expanding	Bridging
P1.B.6 (a) Describe ideas, phenomena (e.g., insect metamorphosis), and text elements (e.g., main idea) based on understanding of a select set of grade-level texts and viewing of multimedia, with substantial support.	P1.B.6 (a) Describe ideas, phenomena (*e.g., fossils**), and text elements (e.g., main idea, events) in greater detail based on understanding of a variety of grade-level texts and viewing of multimedia, with moderate support.	P1.B.6 (a) Describe ideas, phenomena (*e.g., magnetic interactions**), and text elements (e.g., central message, major events) using key details based on understanding of a variety of grade-level texts and viewing of multimedia, with light support.
P2.A.1 Apply understanding of how different text types are organized to express ideas *(e.g. how data is organized within a text*)* to comprehending texts and writing basic texts.	P2.A.1 Apply understanding of how different text types are organized to express ideas *(e.g. how data tables and charts relate to text*)* to comprehending texts and writing texts with increasing cohesion.	P2.A.1 Apply understanding of how different text types are organized to express ideas *(e.g. compare the different ways data is organized and analyzed in a text*),* to comprehending texts and writing cohesive texts.

*Modified to align with NGSS

Emerging	Expanding and Bridging
Sentence frames:	**Sentence frames:**
My data show… *A pattern I see is…* *… and … are similar because they both…* *… and … are different because …*	*From the data, I can infer that …*
Questions/Prompts:	**Questions/Prompts:**
Is this a pattern? *Are these the same or different?* *Organize the data by …* *Make a diagram to show …* *If you change … , will that improve the design?*	*Is there a pattern to these data?* *How is … related to …?* *How does … compare to …?* *How will you organize the data?* *Based on the data, how will you change your design?*

5. Using mathematics and computational thinking

Students enumerate, measure, graph, estimate, describe, organize
- Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success.
- Organize simple data sets to reveal patterns that suggest relationships.
- Describe, measure, estimate, and/or graph quantities (e.g., area, volume, weight, time) to address scientific and engineering questions and problems.
- Create and/or use graphs and/or charts generated from simple algorithms to compare alternative solutions to an engineering problem.   (NGSS Appendix F)

General Strategies for all Students
- ☐ Use opportunities in science to engage in math practices when appropriate
- ☐ Help students see the connections between what they are learning in math to how it is applied in science.
- ☐ Mini-lessons on graphing, measurement

Corresponding ELD Standards
Part 1. Interacting in Meaningful Ways   A. Collaborative: 4. Adapting language choice;
C. Productive 10. Writing

Emerging	Expanding	Bridging
P1.A.4 Recognize that language choices (e.g., vocabulary) vary according to social setting (e.g., playground vs. classroom) with substantial support from peers or adults.	P1.A.4 Adjust language choices (e.g., vocabulary, use of dialogue, etc.) according to purpose task (e.g., persuading, entertaining), social setting, and audience (peers vs. adults), with moderate support from peers or adults.	P1.A.4 Adjust language choices according to purpose (e.g., persuading, entertaining), task and audience (e.g., peer-to-peer vs. peer-to-teacher), with light support from peers or adults.
P1.C.10 (b) Paraphrase text and recount experiences using complete sentences and key words from notes or graphic organizers.	P1.C.10 (b) Paraphrase texts and recount experiences using complete sentences and key words from notes or graphic organizers.	P1.C.10 (b) Paraphrase texts and recount experiences using increasingly detailed complete sentences and key words from notes or graphic organizers.

Emerging	Expanding and Bridging
Sentence frames: *Our results are ...* *The graph/table shows ...* *We measured ...* **Questions/Prompts:** *Read the graph (table).* *Would ... represent this pattern?* *Is this a way to show ... ?* *Do the numbers mean that ...?* *Does the change in ... mean that ...?*	**Sentence frames:** *Based on ... the results show ...* *We measured ... in order to ...* *We can use math in order to ...* **Questions/Prompts:** *What does this represent?* *Show in a graph or table.* *How would you organize ... to show ...?* *How did numbers and patterns help us understand what is going on?* *Do the numbers support your explanation?*

6. Constructing explanations and designing solutions

Students infer, explain, provide evidence, design, identify, apply, solve, compare

- Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard).
- Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
- Identify the evidence that supports particular points in an explanation.
- Apply scientific ideas to solve design problems.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.   (NGSS Appendix F)

General Strategies for all Students

- ☐ Mini-lesson on language structures and norms for engaging in academic discussions
- ☐ Writing frames for explanatory writing
- ☐ Start with diagrams and graphic organizers to formulate ideas
- ☐ Think-Pair-Share to generate ideas
- ☐ Review engineering design process
- ☐ Concept Maps
- ☐ Use crosscutting concepts to think about science ideas with another lens.

Corresponding ELD Standards

Part 1. Interacting in Meaningful Ways   A. Collaborative: 1. Exchanging Information/Ideas, 4. Adapting language choice; C. Productive 10. Writing

Emerging	Expanding	Bridging
P1.A.1 Contribute to conversations and express ideas by asking and answering *yes-no* and *wh-*questions and responding using short phrases.	P1.A.1 Contribute to class, group, and partner discussions, including sustained dialogue, by following turn-taking rules, asking relevant questions, affirming others, and adding relevant information.	P1.A.1 Contribute to class, group, and partner discussions, including sustained dialogue, by following turn-taking rules, asking relevant questions, affirming others, adding relevant information, building on responses, and providing useful feedback.
P1.A.4 Recognize that language choices (e.g., vocabulary) vary according to social setting (e.g., playground vs. classroom), with substantial support from peers or adults.	P1.A.4. Adjust language choices (e.g., vocabulary, use of dialogue, etc.) according to purpose (e.g., persuading, entertaining), social setting, and audience (e.g., peers vs. adults), with moderate support from peers or adults.	P1.A.4 Adjust language choices according to purpose (e.g., persuading, entertaining), task, and audience (e.g., peer-to-peer vs. peer-to-teacher), with light support.

3rd Grade NGSS Science and Engineering Practices with Corresponding ELD standards

Emerging	Expanding	Bridging
P1.C.10 (b) Paraphrase text and recount experiences using complete sentences and key words from notes or graphic organizers.	P1.C.10 (b) Paraphrase texts and recount experiences using complete sentences and key words from notes or graphic organizers.	P1.C.10 (b) Paraphrase texts and recount experiences using increasingly detailed complete sentences and key words from notes or graphic organizers.

Sentence frames: *I observed …* *I think … because…* *We think … is the best solution because …*	**Sentence frames:** *Based on …, I think…* *The relationship between … and … shows that …* *The evidence to support … is …* *There is a pattern that shows …* *Both these solutions …; however, … is better because …* *What evidence do you have that …?*
Questions/Prompts: *Are you saying …?* *Does … mean that …?* *Is … an example of …?* *Do you think … is a result of …?* *Which … caused …?* *Does … relate to this new situation?* *Is … the same or different from …?*	**Questions/Prompts:** *Explain in your own words.* *What ideas show that …?* *What does … mean?* *Give an example.* *What is the effect of …?* *What would result if…?* *What approach did you use to …?* *How is … an example of …?* *Why is … significant?* *How can you apply what you learned about … to …?* *How does … compare to …?*

7. Engaging in argument from evidence

Students discuss, persuade, synthesize, negotiate, suggest, critique, evaluate, reflect
- Compare and refine arguments based on an evaluation of the evidence presented.
- Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.
- Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.
- Construct and/or support an argument with evidence, data, and/or a model.
- Use data to evaluate claims about cause and effect.
- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (NGSS Appendix F)

General Strategies for all Students

☐ Provide norms and structures for students to discuss in pairs, small group, and whole class
☐ Model and discuss expectations for argumentation
☐ Encourage divergent ideas for discussion topics
☐ Use common misconceptions as starting points for argumentation topics
☐ Concept Cartoon
☐ Class debates
☐ Provide both evidence for and against a claim
☐ Claim, Evidence, and Reasoning Framework

Corresponding ELD Standards

Part 1. Interacting in Meaningful Ways: A. Collaborative: 3. Offering Opinions;
B. Interpretive: 7. Evaluating Language Choices; C. Productive: 11. Supporting Opinions

Emerging	Expanding	Bridging
P1.A.3 Offer opinions and negotiate with others in conversations using basic learned phrases (e.g., *I think ...*), as well as open responses, in order to gain and/or hold the floor.	P1.A.3. Offer opinions and negotiate with others in conversations using an expanded set of learned phrases (e.g., *I agree with X, and...*), as well as open responses, in order to gain and/or hold the floor, provide counterarguments, etc.	P1.A.3. Offer opinions and negotiate with others in conversations using a variety of learned phrases (e.g., *That's an interesting idea, but, ...*), as well as open responses, in order to gain and/or hold the floor, provide counter-arguments, elaborate on an idea, etc.
P1.B.7 Describe the language writers or speakers use to support an opinion or present an idea (e.g., by identifying the phrases or words in the text that provide evidence) with prompting and substantial support.	P1.B.7 Describe the specific language writers or speakers use to support an opinion or present an idea (e.g., the specific vocabulary or phrasing used to provide evidence), with prompting and moderate support.	P1.B.7 Describe how well writers and speakers use specific language resources to support an opinion or present an idea (e.g., whether the vocabulary or phrasing used to provide evidence is strong enough) with light support.

3rd Grade NGSS Science and Engineering Practices with Corresponding ELD standards

Emerging	Expanding	Bridging
P1.C.11 Support opinions by providing good reasons and some textual evidence or relevant background knowledge (e.g., referring to textual evidence or knowledge of content).	P1.C.11 Support opinions by providing good reasons and increasing detailed textual evidence (e.g., providing examples from the text) or relevant background knowledge about the content.	P1C.11 Support opinions or persuade others by providing good reasons and detailed textual evidence (e.g., specific events or graphics from text) or relevant background knowledge about the content.

Sentence frames: *I claim...* *My evidence is ...* *I agree/disagree with ...* *because...* *What about...?* *I used to think... but now I think...* *My models shows...* *My data shows...* **Questions/Prompts:** *Do you agree or disagree?* *Do you think ... supports the idea that...?* *Which piece of evidence supports the claim ...?*	**Sentence frames:** *Based on ... I would argue that ...* *Have you considered ...?* *I agree/disagree that ... causes ... because ....* *... meets the criteria, because it ...* **Questions/Prompts:** *Why do you think that is so ...?* *What is your evidence?* *Please explain why you disagree that...* *Why do you think ... supports the idea that ...?*	

8. Obtaining, evaluating, and communicating information

Students read, summarize, describe, compare, combine, explain, communicate

- Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.
- Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.
- Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts.

(NGSS Appendix F)

General Strategies for all Students

- ☐ Reinforce vocabulary using pictorials (review key concepts by illustrating and labeling on chart paper in front of students)
- ☐ Provide ample opportunities for students to talk, write, and read about their science experiences.
- ☐ Use reading and multimedia to deepen students' understanding of phenomena
- ☐ Model and provide scaffolds, (Use reading strategies such as: close reading, jigsaw, guided reading, graphic organizers, and visual literacy strategies.)

Corresponding ELD Standards

Part 1. Interacting in Meaningful Ways: All
Part 2. Learning How English Works: All