


# Lesson Planning Guide

**Part A**  
**Develop Lesson Overview**

Prepare lesson plan foundation:


- Select PEs/standards
- Connect to anchoring phenomenon
- Ask driving question
- Unpack PEs/standards
- Identify lesson topics and resources



**Part B**  
**Create Lesson Plan**

Develop lesson plan:


- Lesson summary and learning goals
- Compile lesson logistics
- Select 5E(s) to guide instruction
- Complete lesson plan details



**Part C**  
**Lesson Instruction and Reflection**

Review and revise lesson plan:

- Keep notes and modify lesson during instruction, as needed
- Review and revise lesson post-instruction



**Key**

Next Generation Science Standards (NGSS)  
PE = Performance Expectation  
SEP = Science and Engineering Practices  
DCI = Disciplinary Core Ideas  
CCC = Crosscutting Concepts  
and  
5Es = The 5E Instructional Model

# Lesson Planning Guide

## Develop Lesson Plans for Instruction

Steps in developing [NGSS](#)-/standards-aligned, phenomenon-based lessons that are guided by the [5Es instructional model](#):

1. Complete the Lesson Plan Overview (Part A) to guide development of lesson plans.
2. Use the Lesson Plan Template (Part B) to create detailed lesson plans.



## Lesson Overview Template (Part A)

**1.a Select grade level NGSS [Performance Expectations \(PEs\)](#) or [Topics](#), or district/state standards that support lesson-based student learning goals.**  
For NGSS, PE color coding reflects its 3-dimensional learning components. Search the [Evidence Statements](#) for details on what students should know and do.

[HS-ESS2-5 Earth's Systems](#)

**1.b Identify a lesson-based [anchoring phenomenon](#) that builds towards understanding of the PEs/standards, and is engaging and relevant to students.**

See more about [phenomena](#) and using [phenomena with NGSS](#).

Why does some sand pile higher when poured, and others spread out?

**1.c Ask a [Driving Question](#), which is authentic and student-focused, that relates to investigating the PEs/standards and phenomenon.**

See more about [Driving Questions](#) and using [Driving Questions with NGSS](#).

Does sand grain size and roundness affect angle of repose?

**1.d Unpack the 3-D learning components of the Performance Expectations/standards in the table below.**

For NGSS guidance, see the [NGSS Topic Arrangements](#) and [NGSS DCI Arrangements](#). Use tools to **unpack** each PE separately.

<b>Science and Engineering Practices (SEP)</b> (skills)	<b>Disciplinary Core Ideas (DCI)</b> (content)	<b>Crosscutting Concepts (CCC)</b> (connections)
Develop and use models Plan and carry out investigations Analyze and interpret data Engage in discussion based on evidence	<b>ESS2.A: Earth Materials and Systems</b> <b>ESS2.B: Plate Tectonics and Large-Scale System Interactions</b> <b>ESS2.C: The Roles of Water in Earth's Surface Processes</b> <b>ESS2.D: Weather and Climate</b> <b>ESS2.E: Biogeology</b>	<b>Energy and Matter</b> <b>Structure and Function</b> <b>Stability and Change</b> <b>Influence of Science, Engineering, and Technology on Society and the Natural World</b> <b>Interdependence of Science, Engineering, and Technology</b>

**1.e Determine students' prior knowledge about the lesson concepts.** (e.g., pre-test, class discussion, exit ticket, 1-minute report, KWL chart, survey, etc.)

Basic Earth rock cycle. Sand comes from sedimentary rocks.

**1.f Identify Lesson Topics and Learning Goals:** List main lesson concepts related to grade level PEs/standards that support student learning goals in figuring out the anchoring phenomenon; revise as needed.

How did grain size and roundness change angle of repose? Students should be able to ID sand grain classification.

**1.g Select Lesson Resources:** Identify resources to develop lessons that address the PEs/standards and investigate the anchoring phenomenon through a variety of sequenced activities; revise as needed (include title and URL).

[www.scienceofsand.com](http://www.scienceofsand.com)



## Lesson Plan Template (Part B)

<b>Grade and Subject</b>	Middle School Geology	<b>Instructional Time (min.)</b>	50
<b>Lesson Title (Topic)</b>	Sand and Angle of Repose		
<b>Anchoring Phenomenon (copy from 1.b)</b>	Why does some sand pile higher when poured, and others spread out?		
<b>Driving Question (copy from 1.c)</b>	Does sand grain size and roundness affect angle of repose?		
<b>Lesson Overview</b>			
<b>Lesson Summary (description)</b>		<b>Lesson Topics and Student Learning Goals (copy from 1.f)</b>	
Use pour method to measure angle of repose of different types of sand from different localities. Begin by searching <a href="http://www.scienceofsand.com">www.scienceofsand.com</a> to compare sand.		How did grain size and roundness change angle of repose? Students should be able to ID sand grain classification.	



Lesson Resources Aligned with Standards		
Lesson Resource (copy from 1.g, sequenced with titles and links)	Resource Standards Alignment (copy from 1.d, standards notated, link optional)	
Teacher Preparation		
Student Misconceptions (potential student ideas that are problematic when engaging in the lesson)	Scientific Terminology (vocabulary named once students “figure out” concepts of lesson)	
Materials Preparation		
Student Needs (activity sheets, data packet, etc.)	Group Needs (lab equipment, group data packets, etc.)	Safety & Technology Needs (unsafe materials, websites cued, etc.)
Supporting Information		
References (links to cite sources of data, images, websites, etc.)	Background Reading (for teachers and/or students)	

## Complete the 5E Instructional Model section(s) that are relevant to the lesson:

### **Engage: *Interest in a concept is generated and students' current understanding is assessed.***

ACTIVATE interest: Introduce anchoring phenomenon and driving question.

- Engages students in the concepts through a short activity or relevant discussion
- Connects students' past and present experiences
- Creates interest and generates curiosity
- Uncovers students' current knowledge and misconceptions
- Initiates students' investigation into the anchoring phenomenon based on an observation, problem, or question

**Phenomenon-based Driving Questions** (questions students are likely to ask about the lesson topic)

**Lesson Activities** (experiment, demonstration, video, visualization, reading, etc., coherently sequenced to help build understanding of PE/standard)

For each activity, provide details of the procedure including timing, teacher guidance, student prompts, strategies for discussions and differentiation, etc.

**Formative Assessment** (activity sheet, Venn diagram, summary, exit ticket, think-pair-share, etc. to check for understanding of lesson concepts)

**Consensus Discussion** (claims, evidence, and reasoning on what students figured out in this lesson)

**New Questions and Next Steps** (student-driven questions, ideas on what to investigate in the next lesson and how to investigate it, etc.)

**AND/OR**

<b>Explore: <i>Students participate in activities to explore questions related to a concept.</i></b>
BUILD Knowledge: Learn the science behind concepts.
<ul style="list-style-type: none"><li>• Students explore the concepts with others to develop a common set of experiences</li><li>• Provides students with one or more actual experiences</li><li>• Offers opportunities for creative thinking and skills development</li><li>• Students make and record observations and ideas, make connections, and ask questions</li><li>• Students usually work in groups</li><li>• Teacher acts as coach or facilitator in student-led investigations</li></ul>
<b>Phenomenon-based Driving Questions</b> (questions students are likely to ask about the lesson topic)
<b>Lesson Activities</b> (experiment, demonstration, video, visualization, reading, etc., coherently sequenced to help build understanding of PE/standard) For each activity, provide details of the procedure including timing, teacher guidance, student prompts, strategies for discussions and differentiation, etc.
<b>Formative Assessment</b> (activity sheet, Venn diagram, summary, exit ticket, think-pair-share, etc. to check for understanding of lesson concepts)
<b>Consensus Discussion</b> (claims, evidence, and reasoning on what students figured out in this lesson)
<b>New Questions and Next Steps</b> (student-driven questions, ideas on what to investigate in the next lesson and how to investigate it, etc.)

AND/OR

**Explain: *Students construct their understanding of a concept and develop evidence-based explanations.***

DEVELOP Concepts: Research information using real-world data.

- Develops students' explanation for the concepts they have been exploring with teacher providing supporting guidance
- Students describe their observations and come up with explanations
- Students listen critically to each other's explanations
- Students learn to apply and interpret evidence
- Develops students' academic vocabulary by applying scientific terms once students have figured out the lesson concepts
- Teacher guides students' reasoning, asks appropriate questions, and directs students to additional supporting resources

**Phenomenon-based Driving Questions** (questions students are likely to ask about the lesson topic)

**Lesson Activities** (experiment, demonstration, video, visualization, reading, etc., coherently sequenced to help build understanding of PE/standard)

For each activity, provide details of the procedure including timing, teacher guidance, student prompts, strategies for discussions and differentiation, etc.

**Formative Assessment** (activity sheet, Venn diagram, summary, exit ticket, think-pair-share, etc. to check for understanding of lesson concepts)

**Consensus Discussion** (claims, evidence, and reasoning on what students figured out in this lesson)

**New Questions and Next Steps** (student-driven questions, ideas on what to investigate in the next lesson and how to investigate it, etc.)



AND/OR

**Elaborate: *Students deepen and expand their understanding by applying their understanding in new contexts.***

APPLY Learning: Utilize information in new ways.

- Extends students' understanding or applies what they have learned in a new setting
- Students use the information they have gained to propose solutions and extend their learning to new situations
- Teacher supports students in broadening their understanding and extend ideas to other situations so they can draw broader conclusions beyond their experiment or investigation

**Phenomenon-based Driving Questions Extended/Applied in a New Context** (questions students are likely to ask about the lesson topic)

**Lesson Activities** (experiment, demonstration, video, visualization, reading, etc., coherently sequenced to help build understanding of PE/standard)

For each activity, provide details of the procedure including timing, teacher guidance, student prompts, strategies for discussions and differentiation, etc.

**Formative Assessment** (activity sheet, Venn diagram, summary, exit ticket, think-pair-share, etc. to check for understanding of lesson concepts)

**Consensus Discussion** (claims, evidence, and reasoning on what students figured out in this lesson)

**New Questions and Next Steps** (student-driven questions, ideas on what to investigate in the next lesson and how to investigate it, etc.)

**AND/OR**

**Evaluate: *Students and teachers have opportunities to assess students' understanding of a concept.***

DEMONSTRATE Ability: Write, illustrate, create, etc. artifacts that accurately describe knowledge gained.

- Students have the opportunity to demonstrate understanding of skills and concepts, and evaluate their own progress
- Teacher evaluates students' understanding and progress, as well as their own instructional practice, and may implement alternative assessment strategies
- Enables adjustment of misconceptions, reinforces students' understanding of the PE concepts in greater depth

**Phenomenon-based Driving Questions** (questions about the lesson topic)

**Skills Learning Performance (SEPs) Goals** (assess student skills related to the lesson)

**Formative Assessment** (quiz, test, report, presentation, poster, video, model, etc. to demonstrate students' understanding about the PEs/standards)

**Content Learning Performance (DCIs, CCCs) Goals** (assess student mastery of lesson content)

**Summative Assessment** (quiz, test, report, presentation, poster, video, model, etc. to demonstrate students' understanding about the PEs/standards)



## Step 4: Lesson Instruction and Reflection

### Lesson Notes During Instruction

- What modifications (instruction, timing, etc.) were made or are needed for the lesson, activities, or resources?
- Which parts of the lesson, activities, or resources were or need to be changed?
- How effective (or ineffective) were the lesson, activities, or resources for student learning?

### Review and Revise Post-Instruction

- Which parts of the lesson were a success?
- What were some challenges about the lesson?
- How could the lesson be changed or improved?