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| **Lesson Planning Guide** |
| **Develop Lesson Plans for Instruction** |
| Steps in developing [NGSS](https://www.nextgenscience.org/)-/standards-aligned, phenomenon-based lessons that are guided by the [5Es instructional model](https://bscs.org/bscs-5e-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.
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| https://lh4.googleusercontent.com/3nF12fEN5h5hgtv4ZofuvibTcwtHVJ_NWtFhMVgHDmo2KU1R-JQY3ndc2Eo8Bc9pXdnqo8Erfx-JMqcT-KaHxMnFOfqsxBUKLF28abqNdDstymCGzJ6SlLhYSu-KzuetFn1Mts6_yLg | **Lesson Overview Template (Part A)** |
| **1.a Select grade level NGSS** [**Performance Expectations**](https://www.nextgenscience.org/search-standards?keys=&type%5B%5D=performance_expectation) **(PEs) or** [**Topics**](https://ngss.nsta.org/AccessStandardsByTopic.aspx)**, 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](https://www.nextgenscience.org/evidence-statements) for details on what students should know and do. |
| High School 10th Grade Science at Harry S. Truman High School, Pennsylvania. HS-ESS2-5 Earth’s Systems: Analyze various sediment samples and determine the roundness, grain size, sorting and probable weathering processes (storms, hurricanes, floods, erosion, etc.) that lead to the samples physical appearance. Based on the roundness and sorting of the sand sample determine what the beach face looks like in terms of steepness (steep, slight angle and flat) and why.  |
| **1.b Identify a lesson-based** [**anchoring phenomenon**](https://static1.squarespace.com/static/56ef1da37da24f301fccaacd/t/5aa86e09652dea04982ceb94/1520987659683/NGSS%2BStorylineTool%231-AnchoringPhenomenon%2B-%2Bv2.2.pdf) **that builds towards understanding of the PEs/standards, and is engaging and relevant to students.**See more about [phenomena](https://www.ngssphenomena.com/) and using [phenomena with NGSS](https://static1.squarespace.com/static/56ef1da37da24f301fccaacd/t/581f4bb3e58c62bd0983dd03/1478446005130/Using%2BPhenomena%2Bin%2BNGSS.pdf). |
| Anchoring phenomenon is weathering processes on sand.  |
| **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](http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=53) and using [Driving Questions with NGSS](http://nstacommunities.org/blog/2013/08/01/essential-questions/). |
| Why is weathering and erosion so important in regards to the appearance of a sand sample and the beach face?  |
| **1.d Unpack the** [**3-D learning components**](https://www.nextgenscience.org/three-dimensions) **of the Performance Expectations/standards in the table below.**For NGSS guidance, see the [NGSS Topic Arrangements](https://ngss.nsta.org/AccessStandardsByTopic.aspx) and [NGSS DCI Arrangements](https://ngss.nsta.org/AccessStandardsByDCI.aspx). Use tools to [unpack](https://ngss.nsta.org/ngss-tools.aspx) each PE separately. |
| [**Science and Engineering Practices**](https://www.nextgenscience.org/sites/default/files/resource/files/Appendix%20F%20%20Science%20and%20Engineering%20Practices%20in%20the%20NGSS%20-%20FINAL%20060513.pdf) **(SEP)****(skills)** | [**Disciplinary Core Ideas**](https://www.nextgenscience.org/sites/default/files/resource/files/AppendixE-ProgressionswithinNGSS-061617.pdf) **(DCI)****(content)** | [**Crosscutting Concepts**](https://www.nextgenscience.org/sites/default/files/resource/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf) **(CCC)****(connections)** |
| **Analyzing and Interpreting Data:** Using a roundness scale and the science of sand website the students will determine the weathering of sand samples.  | **ESS2.C: The Roles of Water in Earth's Surface Processes: How its part in erosion and weathering help shape sand and the beaches.** Students will use waters effect on sediment to determine how the sand currently looks.  | Cause and Effect: How weathering changed the appearance of sand. Students will relate cause and effect for example, many storms on a coast effect he sediment shape and beach face.  |
| 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.) |
| The students will be taught on how various water and weather processes effect coastal sediments and how often it occurs changes the beach face as well as the degree of sediment roundness. They already have a chart for roundness of sediment grains to compare to images on the science of sand website.  |
| **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. |
| 1. Students will be able to determine degree of roundness. 2. Students will learn what types of weathering effects sediments the most.3. Students will determine if the sample is fine, medium, or coarse grained. 4. Students will learn how often weather events have to occur to change the sediment. 5. Students will learn how all of the above information ties into create the beach face.  |
| **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).  |
| -Science of sand website for sample images: <https://www.scienceofsand.info/>-Roundness chart for sample comparisons: <https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.researchgate.net%2Ffigure%2FA-new-roundness-scale-for-sedimentary-particles-after-Powers_fig4_303702743&psig=AOvVaw2FOQwLVh2k09Zs-kJZrt6j&ust=1587604160692000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCLim8MXs-ugCFQAAAAAdAAAAABAD>- Paper to write down all of the determination for each sand sample.  |

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|  | **Lesson Plan Template (Part B)** |
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| **Grade and Subject** | 10th Grade Science Class | **Instructional Time**(min.) | 45 minutes |
| **Lesson Title (Topic)** | Weathering of Sediments  |
| **Anchoring Phenomenon**(copy from 1.b) | The weathering processes of sand. |
| **Driving Question**(copy from 1.c) | Why is weathering and erosion so important in regards to the appearance of a sand sample and the beach face? |
| **Lesson Overview** |
| **Lesson Summary**(description) | **Lesson Topics and Student Learning Goals**(copy from 1.f) |
| Students will work in groups to determine the weathering processes of sand samples and how it relates to the sands shape and the beach face. They will use a roundness chart to assist them. Five samples will be used form the science of sand website and the groups will take notes on the weathering that occurs there based on prior knowledge as well as based off of the look of the sand. They will determine the weathering, degree of roundness and what they think the beach face looks like based off of these variables. These final determinations will then be graded for accuracy and reasoning behind their choices.  | 1. Students will be able to determine degree of roundness. 2. Students will learn what types of weathering effects sediments the most.3. Students will determine if the sample is fine, medium, or coarse grained.4. Students will learn how often weather events have to occur to change the sediment. 5. Students will learn how all of the above information ties into create the beach face. |
| **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) |
| -Science of sand website for sample images: <https://www.scienceofsand.info/> | **Analyzing and Interpreting Data:** Using a roundness scale and the science of sand website the students will determine the weathering of sand samples. |
| -Roundness chart for sample comparisons: <https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.researchgate.net%2Ffigure%2FA-new-roundness-scale-for-sedimentary-particles-after-Powers_fig4_303702743&psig=AOvVaw2FOQwLVh2k09Zs-kJZrt6j&ust=1587604160692000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCLim8MXs-ugCFQAAAAAdAAAAABAD> | **ESS2.C: The Roles of** **Water in Earth's Surface Processes: How its part in erosion and weathering help shape sand and the beaches.** Students will use waters effect on sediment to determine how the sand currently looks. |
| - Paper to write down all of the determination for each sand sample. | **Cause and Effect: How weathering changed the appearance of sand.** Students will relate cause and effect for example, many storms on a coast effect he sediment shape and beach face |
| **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) |
| Students may think that sand shape doesn’t vary much from place to place. Students may disagree in the groups. Students may have difficulty determining an exact roundness in a sample.  | RoundnessAngularSphericity Beach FaceWeathering |
| **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.) |
| Notes about weathering from previous lessonsRoundness chart  | Computer or laptopCombined Notes Paper  | Science of sand website  |
| **Supporting Information** |
| **References**(links to cite sources of data, images, websites, etc.) | **Background Reading**(for teachers and/or students) |
| <https://www.scienceofsand.info/><https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.researchgate.net%2Ffigure%2FA-new-roundness-scale-for-sedimentary-particles-after-Powers_fig4_303702743&psig=AOvVaw2FOQwLVh2k09Zs-kJZrt6j&ust=1587604160692000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCLim8MXs-ugCFQAAAAAdAAAAABAD> | The previous lesson plans on weathering and knowing which regions experience different kinds of weather like hurricanes, tsunamis, floods, earthquakes, etc.  |

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| **Complete the 5E In****structional Model section(s) that are relevant to the lesson:** |

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| **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
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| **Phenomenon-based Driving Questions** (questions about the lesson topic) |
| How does weathering effect sand samples? There size, shape and roundness? How does all of these factors effect the beach face?  |
| **Skills Learning Performance (SEPs) Goals** (assess student skills related to the lesson) |
| 1. Students will be able to determine degree of roundness. 2. Students will learn what types of weathering effects sediments the most.3. Students will determine if the sample is fine, medium, or coarse grained.4. Students will learn how often weather events have to occur to change the sediment. 5. Students will learn how all of the above information ties into create the beach face. |
| **Formative Assessment** (quiz, test, report, presentation, poster, video, model, etc. to demonstrate students’ understanding about the PEs/standards) |
| After the activity students will be graded on how well they determined the factors of the five sand samples from their notes during the activity. Each group will have to explain why they chose what they chose.  |
| **Content Learning Performance (DCIs, CCCs) Goals** (assess student mastery of lesson content) |
| Individually students will be given images from the science of sand website of 5 other samples and will have to determine the same factors for the new samples to determine if they learned anything new after the class discussion of the group work.  |
| **Summative Assessment** (quiz, test, report, presentation, poster, video, model, etc. to demonstrate students’ understanding about the PEs/standards) |
| The final assessment of the knowledge will be on a test that covers these lesson plans.  |