# Curriculum

The process of students actively building, exploring, investigating, inquiring and communicating together develops a vast range of benefits. Here is an overview:

**Science**
Investigating the collection, storage and transfer of energy; measuring force and speed, and exploring the effect of friction; investigating simple machines, developing scientific fair testing, pursuing purposeful inquiry, predicting and measuring, collecting data and drawing conclusions.

**Technology**
Designing, making (building), testing and evaluating model solutions to match real needs; choosing appropriate materials and processes; exploring systems and subsystems that transform and transfer energy; using two-dimensional instructions to develop technical understanding; identifying technical components to create three-dimensional working models and working collaboratively in a team.

**Engineering**
Engineering design, indentifying energy, and investigating and evaluating variables with science, technology, and mathematics are all part of the engineering process.

**Mathematics**
Using mathematics in the fields of science and technology; measuring distance, time and mass, calculating speed (velocity), and weight and efficiency; using graphical means to present predictions and measurements, tabulating and interpreting data, and informally calculating ratios.

# Activity Pack for Renewable Energy Add-on Set Learning Grid

| Objective Number | NGSS Grade 6-8<br>● = Fully covered<br>◐ = Partially covered | Activities | | | | | | Problem-Solving Activities | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hand Generator | Solar Station | Wind Turbine | Hydro Turbine | Solar Vehicle | Boat Pulley | Lawn Mower | Moving Sign | Motorized Fan | Court Lights |
| **Disciplinary Core Ideas: Physical Science** | | | | | | | | | | | |
| 1 | MS-PS2 Motion and Stability: Forces and Interactions | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 2 | MS-PS3 Energy | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| **Crosscutting Concepts** | | | | | | | | | | | |
| 1 | Patterns | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 2 | Cause and effect: Mechanism and explanation | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 3 | Scale, proportion, and quantity | ● | ◐ | ● | ● | ● | ● | ◐ | ◐ | ◐ | ◐ |
| 4 | Systems and system models | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 5 | Energy and matter: Flows, cycles, and conservation | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 6 | Structure and Function | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 7 | Stability and change | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| **Science and Engineering Practices** | | | | | | | | | | | |
| 1 | Asking questions and Defining Problems | ◐ | ● | ◐ | ◐ | ◐ | ◐ | ● | ● | ● | ● |
| 2 | Developing and using models | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 3 | Planning and carrying out investigations | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 4 | Analyzing and interpreting data | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 5 | Using mathematics, Informational and Computer Technology, and computational thinking | ◐ | ◐ | ◐ | ◐ | ● | ● | ● | ● | ● | ● |
| 6 | Constructing explanations and designing solutions | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 7 | Engaging in argument from evidence | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ● | ● | ● | ● |
| 8 | Obtaining, evaluating, and communicating information | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

| Objective Number | Common Core State Standards Grade 6-8<br>● = Fully covered<br>◐ = Partially covered | Activities | | | | | | Problem-Solving Activities | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hand Generator | Solar Station | Wind Turbine | Hydro Turbine | Solar Vehicle | Boat Pulley | Lawn Mower | Moving Sign | Motorized Fan | Court Lights |
| **Mathematical Practice** | | | | | | | | | | | |
| MP1 | Make sense of problems and persevere in solving them | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| MP2 | Reason abstractly and quantitatively | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| MP3 | Construct viable arguments and critique the reasoning of others | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| MP4 | Model with mathematics | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| MP5 | Use appropriate tools strategically | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| MP6 | Attend to precision | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| MP7 | Look for and make use of structure | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| MP8 | Look for and express regularity in repeated reasoning | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| **Ratios & Proportional Relationships** | | | | | | | | | | | |
| 6.RP.A | Understand ratio concepts and use ratio reasoning to solve problems | ◐ | | | ◐ | ◐ | ◐ | | | | |
| 7.RP.A | Analyze proportional relationships and use them to solve real-world and mathematical problems | ◐ | ◐ | ◐ | ◐ | ◐ | | | | | |
| **Expressions and Equations** | | | | | | | | | | | |
| 7.EE.B | Solve real-life and mathematical problems using numerical and algebraic expressions and equations | | | | | ● | ● | | | | |
| 8.EE.B | Understand the connections between proportional relationships, lines, and linear equations | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | | | | |
| 8.EE.C | Analyze and solve linear equations and pairs of simultaneous linear equations | | | | | ● | ● | | | | |
| **Function** | | | | | | | | | | | |
| 8.F.B | Use functions to model relationships between quantities | ◐ | | | ◐ | ◐ | ◐ | | | | |
| **Speaking and Listening** | | | | | | | | | | | |
| SL 6-8.1 | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| SL 6-8.4 | Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation | ● | ● | ● | ● | ● | ● | ◐ | ◐ | ◐ | ◐ |
| **Reading Standards for Literacy in Science and Technical** | | | | | | | | | | | |
| RST 6-8.3 | Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks | ● | ● | ● | ● | ● | ● | | | | |
| RST 6-8.4 | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| RST 6-8.7 | Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table) | ● | ● | ● | ● | ● | ● | | | | |
| **Writing Standards for Literacy in History/Social Studies, Science, & Technical Subjects** | | | | | | | | | | | |
| WHST 6-8.1 | Obtaining, evaluating, and communicating information | ● | ● | ● | ● | ● | ● | ◐ | ◐ | ◐ | ◐ |
| WHST. 6-8.2 | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes | ● | ● | ● | ● | ● | ● | ◐ | ◐ | ◐ | ◐ |
| WHST. 6-8.4 | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience | ● | ● | ● | ● | ● | ● | ◐ | ◐ | ◐ | ◐ |

| Observation Checklist Part 1<br><br>**Science and Engineering Practices**<br>**Grade 6-8**<br><br>Use the Bronze (1), Silver (2), Gold (3), and Platinum (4) proficiency level descriptions, or another assessment scale that is relevant to your school context. | | Name(s) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Practice 1: I observed students asking questions** | | | | | | | | | | | | |
| a | to seek more information. | | | | | | | | | | | |
| b | to seek evidence for a claim. | | | | | | | | | | | |
| c | to challenge a claim or interpretation of data. | | | | | | | | | | | |
| d | to identify and understand independent and dependent variables. | | | | | | | | | | | |
| e | that can be investigated in this class. | | | | | | | | | | | |
| **Practice 2: I observed students developing and/or using a model** | | | | | | | | | | | | |
| a | to explore its limitations. | | | | | | | | | | | |
| b | to explore what happens when parts of the model are changed. | | | | | | | | | | | |
| c | to show the relationship between variables. | | | | | | | | | | | |
| d | to make predictions. | | | | | | | | | | | |
| e | to generate data about what they are designing or investigating. | | | | | | | | | | | |
| **Practice 3: I observed students planning and carrying out investigations** | | | | | | | | | | | | |
| a | that included independent and dependent variables and controls. | | | | | | | | | | | |
| b | that included appropriate measurement and recording tools. | | | | | | | | | | | |
| c | that tested the accuracy of various methods for collecting data. | | | | | | | | | | | |
| d | to collect data to answer a scientific question or test a design solution. | | | | | | | | | | | |
| e | to test the performance of a design under a range of conditions. | | | | | | | | | | | |
| **Practice 4: I observed students analyzing and interpreting data** | | | | | | | | | | | | |
| a | by constructing graphs. | | | | | | | | | | | |
| b | to identify linear and non-linear relationships. | | | | | | | | | | | |
| c | to distinguish between cause and effect vs. correlational relationships. | | | | | | | | | | | |
| d | by using statistics and probability such as mean and percentage. | | | | | | | | | | | |
| e | to determine similarities and differences in findings. | | | | | | | | | | | |
| f | to determine a way to optimize their solution to a design problem. | | | | | | | | | | | |

Notes:

## Observation Checklist Part 2

**Science and Engineering Practices**
**Grade 6-8**

Use the Bronze (1), Silver (2), Gold (3), and Platinum (4) proficiency level descriptions, or another assessment scale that is relevant to your school context.

| | | Name(s) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Practice 5: I observed students using mathematics and computational thinking** | | | | | | | | | | | | |
| a | by including mathematical representations in their explanations and design solutions. | | | | | | | | | | | |
| b | by using an algorithm to solve a problem. | | | | | | | | | | | |
| c | by using concepts such as ratio, rate, percent, basic operations, or simple algebra. | | | | | | | | | | | |
| **Practice 6: I observed students constructing explanations and design solutions** | | | | | | | | | | | | |
| a | that included quantitative and qualitative relationships. | | | | | | | | | | | |
| b | that are based on scientific ideas, laws and theories. | | | | | | | | | | | |
| c | that connect scientific ideas, laws, and theories to their own observations. | | | | | | | | | | | |
| d | that apply scientific ideas, laws, and theories. | | | | | | | | | | | |
| e | to help optimize design ideas while making tradeoffs and revisions. | | | | | | | | | | | |
| **Practice 7: I observed students engaging in arguments from evidence** | | | | | | | | | | | | |
| a | that compare and critique two arguments on the same topic. | | | | | | | | | | | |
| b | while respectfully providing and receiving critiques using appropriate evidence. | | | | | | | | | | | |
| c | while presenting oral or written statements supported by evidence. | | | | | | | | | | | |
| d | while evaluating different design solutions based on agreed-upon criteria and constraints. | | | | | | | | | | | |
| **Practice 8: I observed students evaluating and communicating information** | | | | | | | | | | | | |
| a | when they read scientific text adapted for the classroom. | | | | | | | | | | | |
| b | when they read or wrote information in combinations of text, graphs, diagrams, and other media. | | | | | | | | | | | |
| c | when they created presentations about their investigations and/or design solutions. | | | | | | | | | | | |

Notes: