

# Mapping Science and Engineering Projects to Core Teaching Standards

Independent science and engineering projects are excellent vehicles for building not only science skills but also applied math skills and language art skills. The sections below show how key Science Buddies resources, as well as completed science and engineering projects, can be used to fulfill core science, math, and language standards.

## Science and Engineering Standards

Science and engineering standards, as defined by Next Generation Science Standards and closely aligned state science standards, are divided into three dimensions of learning: Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts. Individual science and engineering projects, as well as hands-on STEM activities and lesson plans, can be used to teach specific Disciplinary Core Ideas (i.e. science or technology topics). Science Buddies Lesson Plans specifically list the aligned Disciplinary Core Ideas, our Project Ideas each have an introduction section which includes a list of associated vocabulary and concepts, and our STEM Activities list the associated key concepts.

Science Buddies Project Ideas, Lesson Plans, and STEM Activities also help students engage with and learn Science and Engineering Practices and Crosscutting Concepts. The tables below show how those align to our content.

**NGSS: Science and Engineering Practices**

	Planning and Carrying Out Investigation	Analyzing and Interpreting Data	Obtaining, Evaluating, and Communicating Information	Asking Questions and Defining Problems	Constructing Explanations and Designing Solutions	Developing and Using Models	Using Mathematics and Computational Thinking	Engaging in Argument from Evidence
Science Project Ideas	✓	✓	✓	✓	✓	*	✓	✓
Engineering Project Ideas	✓	✓	✓	✓	✓	✓	✓	✓
STEM Activities	✓	✓	✓	*	*	*	*	*
Using the Science Fair Project Guide <sup>1</sup>		✓	✓	✓	*	*		✓
Using Ask an Expert	✓	*	✓	✓	*	*	*	*
Lesson Plans	Listed in a table within each lesson plan							

**Key:** ✓ The vast majority of the resources in this area fulfill the standard.

\* The standard is fulfilled in some, but not all resources, depending on the student's specific topic

<sup>1</sup> The most relevant sections of the Science Fair Project Guide are "Getting Started" and "Analyzing Your Data and Drawing a Conclusion."

### NGSS: Crosscutting Concepts

	Patterns	Cause and Effect	Energy and Matter	Structure and Function	Stability and Change	Systems and System Models	Scale, Proportion, and Quantity	Influence of Engineering, Technology, and Science on the Natural World	Interdependence of Science, Engineering, and Technology
Science Project Ideas	✓	✓	*	*	✓	*	✓	✓	*
Engineering Project Ideas	✓	✓	*	✓	*	✓	✓	✓	*
STEM Activities	✓	✓	*	*	*	*	✓	✓	*
Writing a Research Paper Summary of a Science/Engineering Project	✓	✓	*	*	*	*	✓	✓	*
Using the Science Fair Project Guide <sup>2</sup>	✓	✓	*	*	✓	*	*	✓	*
Using Ask an Expert	*	*	*	*	*	*	*	*	*
Lesson Plans	Listed in a table within each lesson plan								

**Key:** ✓ The vast majority of the resources in this area fulfill the standard.

\* The standard is fulfilled in some, but not all resources, depending on the student's specific topic

<sup>2</sup> The most relevant sections of the Science Fair Project Guide are "Testing Your Hypothesis by Doing an Experiment" and "Analyzing Your Data and Drawing a Conclusion."

## Mathematics Standards

Undertaking a science or engineering project can teach a student a variety of specific mathematics standards. For example, students often apply mathematics to the real world to design an apparatus or take measurements. Collected numerical data must also be analyzed using mathematics principles and equations. This process is especially important to help students understand how scientific principles are defined by mathematical equations. The table below shows how science and engineering projects and other Science Buddies resources fulfill general mathematics standards from the Common Core State Standards (CCSS) developed by the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO).

**CCSS for Mathematics**

	1. Make sense of problem and persevere in solving them	2. Reason abstractly and quantitatively	3. Construct viable arguments and critique the reasoning of others	4. Model with mathematics	5. Use appropriate tools strategically	6. Attend to precision	7. Look for and make use of structure	8. Look for express regularity in repeated reasoning
Science Project Ideas	✓	✓	✓	*	✓	*	*	*
Engineering Project Ideas	✓	✓	✓	*	✓	*	*	*
STEM Activities	*	✓	*	*	*	*	*	
Writing a Research Paper Summary of a Science/Engineering Project	*	*	✓	*	✓	*	*	
Using the Science Fair Project Guide <sup>3</sup>	✓	*	*	*	*	*	*	
Using Ask an Expert	*	*	*		*		*	
Lesson Plans	*	*	✓	*	*	*	*	

**Key:** ✓ The vast majority of the resources in this area fulfill the standard.

\* The standard is fulfilled in some, but not all resources, depending on the student's specific topic

<sup>3</sup> The most relevant section of the Science Fair Project Guide is "Analyzing Your Data and Drawing a Conclusion."

## Language Art Standards

A variety of language arts and literacy standards can be taught through doing a science or engineering project. The associated tasks of performing background research, writing a research paper, maintaining a laboratory notebook, creating a display board, and orally communicating one’s findings all require the application of language art skills. The table below shows how science and engineering projects and other Science Buddies resources fulfill general language arts and literacy standards from the CCSS developed by the NGA Center and the CCSSO.

**CCSS for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects**

	Reading				Writing				Speaking and Listening		Language		
	Key Ideas and Details	Craft and Structure	Integration of Knowledge and Ideas	Range of Reading and Level of Text Complexity	Text Types and Purposes	Production and Distribution of Writing	Research to Build and Present Knowledge	Range of Writing	Comprehension and Collaboration	Presentation of Knowledge and Ideas	Conventions of Standard English	Knowledge of Language	Vocabulary Acquisition and Use
Science Project Idea	✓	✓	✓	✓	✓	✓	✓	✓	*	✓	✓		✓
Engineering Project Idea	✓	✓	✓	✓	✓	✓	✓	✓	*	✓	✓		✓
STEM Activities	✓												✓
Writing a Research Paper Summary of a Science/Engineering Project	✓	✓	✓	✓	✓	✓	✓	✓	*	✓	✓	*	✓
Using the Science Fair Project Guide <sup>4</sup>	✓	✓	✓	✓	✓	*	✓	*	*	*	✓		✓
Using Ask an Expert	✓	✓	✓		✓	✓			✓	*	*		*
Lesson Plan					*	*	*	*	✓	✓			✓

**Key:** ✓ The vast majority of the resources in this area fulfill the standard.

\* The standard is fulfilled in some, but not all resources, depending on the student’s specific topic

4 The most relevant sections of the Science Fair Project Guide are “Doing Your Background Research” and “Communicating Your Results.”