Appendix

Standards Alignment

All of us have a stake, as individuals and as a society, in scientific literacy. An understanding of science makes it possible for everyone to share in the richness and excitement of comprehending the natural world. Scientific literacy enables people to use scientific principles and processes in making personal decisions and to participate in discussions of scientific issues that affect society. A sound grounding in science strengthens many of the skills that people use every day, like solving problems creatively, thinking critically, working cooperatively in teams, using technology effectively, and valuing life-long learning. And the economic productivity of our society is tightly linked to the scientific and technological skills of our work force.

Many types of individuals will play a critical role in improving science education: teachers; science supervisors; curriculum developers; publishers; those who work in museums, zoos, and science centers; science educators; scientists and engineers across the nation; school administrators; school board members; parents; members of business and industry; and legislators and other public officials.

- Richard Klausner, Chairman
  National Committee on Science Education Standards and Assessment
- Bruce Alberts, President
  National Academy of Sciences

The Cookie Jar Mystery helps learners meet the National Science Education Standards (NSES) as well as the Next Generation Science Standards (NGSS) and the Common Core Learning Standards (CCLS).

Preparing our schoolchildren for future scientific careers and research is at the heart of the effort to promote a standardized way of evaluating science learning, teaching and programs in the United States today. To support that preparation, many schools are turning to activities outside of the traditional classroom.

The Cookie Jar Mystery, a 12-activity program that excites learners about the challenges and processes in forensic science, is adaptable for after-school programs, for youth groups and summer camps, for museum and intersession programming.

The NSES encourage the development of activities throughout our communities to support high achievement. Among the strong recommendations of the NSES are the following areas of emphasis:

- Engaging in activities that investigate scientific questions and extend over a period of time
- Using many skills: procedures, thinking skills, managing data, using technology and lab tools
- Gathering students in groups to engage in problem solving and to use evidence to defend their conclusions
- Publicly sharing results with classmates and teachers

In *The Cookie Jar Mystery*, students are exposed to all of these new instructional emphases, and experience science learning in an atmosphere characterized by high interest and developmentally appropriate ideas.

Ideally suited for learners in grades 4-5, *The Cookie Jar Mystery* activities meet many of the specific content standards described in the NSES. Below we highlight just a few of the key standards that "get a workout" when learners are engaged in *The Cookie Jar Mystery*'s forensic labs and investigations.

National Science Education Standards

CONTENT STANDARD A:
As a result of activities, all students should develop:

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Help students achieve these standards through the following practices or procedures:

- Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.
- Scientists use different kinds of investigations depending on the questions they are trying to answer. Types of investigations include: describing objects, events, and organisms; classifying them; and doing a fair test (experimenting).
- Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists obtain using only their senses.
- Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge). Good explanations are based on evidence from investigations.
- Scientists make the results of their investigations public; they describe the investigations in ways that enable others to repeat the investigations.

CONTENT STANDARD B:
As a result of the activities, all students should develop an understanding of:

- Properties of objects and materials.
- Position and motion of objects.
- Scientists review and ask questions about the results of other scientists' work.
- Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools, such as rulers, balances, and thermometers.
- Objects are made of one or more materials, such as paper, wood, and metal. Objects can be described by the properties of the materials from which they are made, and those properties can be used to separate or sort a group of objects or materials.
- Materials can exist in different states--solid, liquid, and gas. Some common materials, such as water, can be changed from one state to another by heating or cooling.
- The position of an object can be described by locating it relative to another object or the background.
- An object's motion can be described by tracing and measuring its position over time.

CONTENT STANDARD E:
As a result of activities, all students should develop:

- Abilities of technological design.
- Understanding about science and technology.
- Abilities to distinguish between natural objects and objects made by humans.

IDENTIFY A SIMPLE PROBLEM. In problem identification, children should develop the ability to explain a problem in their own words and identify a specific task and solution related to the problem.

PROPOSE A SOLUTION. Students should make proposals to build something or get something to work better; they should be able to describe and communicate their ideas. Students should recognize that designing a solution might have constraints, such as cost, materials, time, space, or safety.

IMPLEMENT PROPOSED SOLUTIONS. Children should develop abilities to work individually and collaboratively and to use suitable tools, techniques, and quantitative measurements when appropriate. Students should demonstrate the ability to balance simple constraints in problem solving.

EVALUATE A PRODUCT OR DESIGN. Students should evaluate their own results or solutions to problems, as well as those of other children, by considering how well a product or design met the challenge to solve a problem. When possible, students should use measurements and include constraints and other criteria in their evaluations. They should modify designs based on the results of evaluations.

COMMUNICATE A PROBLEM, DESIGN, AND SOLUTION. Student abilities should include oral, written, and pictorial communication of the design process and product. The communication might be show and tell, group discussions, short written reports, or pictures, depending on the students' abilities and the design project.

SCIENCE AS INQUIRY STANDARDS:
Science as inquiry is basic to science education and a controlling principle in the ultimate organization and selection of students' activities. The standards on inquiry highlight the ability to conduct inquiry and develop understanding about scientific inquiry.

Engaging students in inquiry helps students develop:

- Understanding of scientific concepts
- An appreciation of "how we know" what we know in science.
- Understanding of the nature of science.
- Skills necessary to become independent inquirers about the natural world.
- The dispositions to use the skills, abilities, and attitudes associated with science.

Students at all grade levels and in every domain of science should have the opportunity to use scientific inquiry and develop the ability to think and act in ways associated with inquiry, including asking questions, planning and conducting investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments.

*Material in this section was quoted from National Science Education Standards, National Committee on Science Education Standards and Assessment, National Research Council.

Our staff would be happy to help you make more connections with NSES. Please contact us for more information.

You can learn more about the National Science Education Standards. Please visit the NSES website at http://www.nap.edu/html/nses/.

Next Generation Science Standards

In addition, *The Cookie Jar Mystery* helps learners meet the practices, cross-cutting concepts, and disciplinary core ideas that comprise the Next Generation Science Standards. The practices, concepts, and disciplinary ideas specifically covered in this unit include:

PRACTICES:

Asking Questions and Defining Problems

- Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources, and, when appropriate, frame a hypothesis based on observations and scientific principles.

Planning and Carrying Out Investigations

- Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.
- Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.
- Conduct an investigation to produce data to serve as the basis for evidence that can meet the goals of the investigation.

Analyzing and Interpreting Data

- Analyze and interpret data to determine similarities and differences in findings.

Engaging in Argument from Evidence

- Support an argument with evidence, data, or a model.

Scientific Knowledge is Based on Empirical Evidence

- Science knowledge is based upon logical and

conceptual connections between evidence and explanations.

- Science disciplines share common rules of obtaining and evaluating empirical evidence.

CROSS-CUTTING CONCEPTS:
Patterns

- Patterns can be used to identify cause-and-effect relationships.
- Graphs, charts, and images can be used to identify patterns in data.

DISCIPLINARY CORE IDEAS:
PS1.A: Structure and Properties of Matter

- Measurements of a variety of properties can be used to identify materials.

LS3.A: Inheritance of Traits

- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.

LS3.B: Variation of Traits

- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.

Common Core Learning Standards

In addition to meeting the National Science Education Standards (NSES) and Next Generation Science Standards (NGSS), this unit meets Common Core Learning Standards (CCLS) in English Language Arts and Literacy. Specific CCLS addressed include:

CCSS.ELA-Literacy.CCRA.SL.1:
Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

CCSS.ELA-Literacy.CCRA.SL.2:
Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

CCSS.ELA-Literacy.CCRA.SL.4:
Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

CCSS.ELA-Literacy.CCRA.R.1:
Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

Standards Matrix

Standard	Lesson											
	1	2	3	4	5	6	7	8	9	10	11	12
National Science Education Standards												
Content Standard A : Teachers of science plan an inquiry-based science program for their students.	•	•	•	•	•	•	•	•	•	•	•	•
Content Standard B: Teachers of science guide and facilitate learning.	•	•	•	•	•	•	•	•	•	•	•	•
Content Standard E: Teachers of science develop communities of science learners that reflect the intellectual rigor of scientific inquiry and the attitudes and social values conducive to science learning.	•	•	•	•	•	•	•	•	•	•	•	•
Science as Inquiry	•	•	•	•	•	•	•	•	•	•	•	•
Next Generation Science Standard												
Practice: Asking Questions and Defining Problems	•	•	•	•	•	•	•	•	•	•	•	•
Practice: Planning and Carrying Out Investigations		•	•	•	•	•	•	•	•	•	•	
Practice: Analyzing and Interpreting Data	•	•	•	•	•	•	•	•	•	•	•	•
Practice: Engaging in Argument from Evidence	•	•	•	•	•	•	•	•	•	•	•	•
Practice: Scientific Knowledge is Based on Empirical Evidence	•	•	•	•	•	•	•	•	•	•	•	•
Cross-Cutting Concept: Patterns							•		•		•	•
Disciplinary Core Idea: 3-LS3-1: Inheritance and Variation of Traits - Different organisms vary in how they look and function because they have different inherited information.					•		•	•	•	•		
Disciplinary Core Idea: 5-PS1-3: Matter and It's Interactions -Make observations and measurements to identify materials based on their properties		•	•	•	•	•		•				
Disciplinary Core Idea: 5-PS1-4: Matter and It's Interactions - Conduct an investigation to determine whether the mixing of two or more substances results in new substances.			•					•				

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Standard	Lesson											
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Common Core Learning Standard												
CCSS.ELA-Literacy.CCRA.SL.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.	•	•	•	•	•	•	•	•	•	•	•	•
CCSS.ELA-Literacy.CCRA.SL.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.	•	•	•	•	•	•	•	•	•	•	•	•
CCSS.ELA-Literacy.CCRA.SL.4:: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.		•	•	•	•	•	•	•	•	•	•	•
CCSS.ELA-Literacy.CCRA.R.1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.	•	•	•	•	•	•	•	•	•	•	•	
CCSS.ELA-LITERACY.CCRA.R.3: Analyze how and why individuals, events, or ideas develop and interact over the course of a text.		•	•	•	•	•	•	•	•	•	•	•
CCSS.ELA-LITERACY.CCRA.W.1: Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.		•	•	•	•	•	•	•	•	•	•	•
CCSS.ELA-LITERACY.RI.4.1: Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.	•	•	•	•	•	•	•	•	•	•	•	•
CCSS.MATH.CONTENT.4.MD.A.1: Know relative sizes of measurement units within one system of units							•			•		
CCSS.MATH.CONTENT.5.MD.A.1: Convert among different-sized standard measurement units within a given measurement system										•		