

Scientific Procedures & Safety

Media Type: DVD

Duration: 22 minutes

Goal: To gain an understanding of the procedures aligned by the scientific method and the safety applications scientists utilize in experimentation.

Description: This presentation introduces the steps of the scientific method, as well as demonstrates the importance of safety in the science lab. The history of major discoveries and inventions attributed to science are also explored. Throughout this production, students will gain an understanding of developments made through science, as well as the limitations it encompasses. Agricultural and food scientists discuss various issues impacting future research. Featuring Mohammad Koohmaraie, Ph.D., CEO, Meat Division IEH Laboratories and Consultation Group; Mandy Carr Johnson, Executive Director of Research, National Cattlemen's Beef Association; Tommy Wheeler, Research Leader, U.S. MARC.

Objectives:

1. To explore major discoveries and inventions impacting everyday life.
2. To understand the scientific method and the application of each step in a scientific experiment.
3. To comprehend safety precautions associated with the laboratory.



College & Career Readiness Anchor Standards for Speaking and Listening

Speaking & Listening Standards	
Comprehension & Collaboration	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.
	Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
	9-12.1 Initiate and participate effectively in a range of collaborative discussions with diverse partners on grades 9–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
	9-10.2 Integrate multiple sources of information presented in diverse media or formats evaluating the credibility and accuracy of each source.
	11-12.2 Integrate multiple sources of information presented in diverse formats and media in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
Presentation of Knowledge & Ideas	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.
	Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
	9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
	11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
	9-12.5 Make strategic use of digital media in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

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College & Career Readiness Anchor Standards for Writing

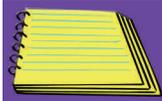
Writing Standards

Text Types & Purposes	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.	
	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.	
	9-12.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
	9-12.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
Production & Distribution of Writing	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	
	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.	
	9-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
	9-10.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
	11-12.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Research to Build & Present Knowledge	Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.	
	Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.	
	Draw evidence from literary or informational texts to support analysis, reflection, and research.	
	9-12.7	Conduct short as well as more sustained research projects to answer a question or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
	9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
	11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
	9-12.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.

Science, Technology, Engineering & Mathematics Career Cluster (ST)

Cluster	Standard
	Apply engineering skills in a project that requires project management, process control and quality assurance.
	Use technology to acquire, manipulate, analyze and report data.
	Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
Science & Mathematics Career Pathway (ST-SM)	Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
	Analyze the impact that science and mathematics has on society.
	Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

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Lesson Plan

Class 1: Begin the class by distributing the *Scientific Procedures & Safety Worksheet* and *Vocabulary Handout*. Show *Scientific Procedures & Safety (Part 1)*. Have the students complete the *Science History Timeline Activity*.



8 min.

Class 2: Have the students complete their timelines. Show *Scientific Procedures & Safety (Part 2)*. Remind the students to use the *Worksheet* and *Vocabulary Handout* as reference materials. Introduce the *Mini Science Fair Project*, and allow students to begin brainstorming ideas.



10 min.

Class 3: Remind students to continue using the *Worksheet* and *Vocabulary Handout*. Show *Scientific Procedures & Safety (Part 3)*. Have the students complete the *Dress for Lab Safety Success Activity*. If time allows, have students begin the *Safety Poster Activity*.



2 min.

Class 4: The students will complete the *Safety Poster Activity*. Remind students to continue using the *Worksheet* and *Vocabulary Handout*, and show *Scientific Procedures & Safety (Part 4)*. Introduce the *Great Discoveries in Science Project*, and allow students to begin.



2 min.

Class 5: Have students complete the *Great Discoveries in Science Project*. After, ask students about their progress on the *Mini Science Fair Project* and answer students' questions regarding it.

Class 6: Introduce the *Biographies in Science Project*, and allow students the entire class period to complete it. If needed students may finish it for homework. At the end of class, instruct students to choose either the *Great Discoveries in Science Project* or the *Biographies in Science Project* to present to the class during the next class period.

Class 7: Instruct the students to complete the *Scientific Procedures & Safety Crossword*. Administer the *Scientific Procedures & Safety Assessment*. It can be found in *Scientific Procedures & Safety (Part 5)*. Have students present their chosen project. At the end of class, remind students the *Mini Science Fair Projects* will be displayed during the next class period.



5 min.

Class 8: Display *Mini Science Fair Projects* and allow students to discuss them.



Lesson Links

Science Buddies

- <http://www.sciencebuddies.org>

ThinkQuest Library: Science & Technology

- http://thinkquest.org/pls/html/f?p=52300:30:878068178108019:::P30_CATEGORY_ID:CPJ_SCIENCE_TECHNOLOGY



Career & Technical Student Organizations

Family, Career & Community Leaders of America

- Applied Technology
- National FFA
- Agri-Science Fair



Career Connections

- iCEV50041, Randall Huffman, Ph.D., Vice President of Scientific Affairs, American Meat Institute
- iCEV50014, Paolo Castiglione, Ph.D., Research Scientist, Decagon Devices, Inc.
- iCEV50031, Kim Green, Genetics Lab Technician, Global Genetics & Biologicals

Additional Teaching Strategies:

- Designing an Experiment Activity
- Experimental Design: Paper Airplane Activity
- Goat Feed Activity
- Impact of Research Activity
- Lab Cleaning Activity
- Microscope Diagram Activity
- Microscope Lab Activity
- Understanding Controlled Experiments Activity
- Water Taste Test Activity

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Lab Activities

Science History Timeline

Directions:

Have students develop a timeline of key scientific advancements made throughout history. Instruct students to include pictures and/or illustrations for key components of the timeline. Students may work in groups or individually.

Safety Poster

Directions:

Have students work individually or in small groups. Instruct students to develop a poster over lab safety rules. Display posters where they may be viewed by the rest of the school.

Dress for Lab Safety Success

Directions:

Gather articles of clothing and other items (safety glasses, gloves, shoes, jewelry, etc.) which should and should not be worn in various laboratory settings. Divide students into groups and provide them with a set of gathered items. Instruct each group to dress one group member so that they would be dressed correctly for a lab setting. Have them dress a second group member so that they would not be dressed correctly for a lab setting. Have each group explain why their dressed-up group members are or are not ready to work in a lab. You may also want to bring a camera as end results can be entertaining and instructional. See the *Dress for Lab Safety Success Teach Instruction Sheet* for more details.



Projects

Mini Science Fair

Directions:

Using the scientific method, students will research, develop and conduct their own scientific experiment. Allow an appropriate amount of time for completion of student experiments. Once all the students have completed their research have them develop a presentation of their methods and results. The students will need to analyze and discuss their research methodology and data in the presentation. Have them explain how their project could affect science and the future. Arrange for a science fair where students can display their posters and discuss their work. If desired, bring in outside judges and have students dress for the occasion.

Great Discoveries in Science

Directions:

Have students work in groups or individually. Instruct students to select and research a significant scientific discovery in the history of mankind. Approve each discovery selected to avoid multiple presentations over the same topic. Have students develop a Microsoft® PowerPoint® presentation over their topic which they will present to the class. Have students present how this discovery changed science and/or everyday life. Encourage students to include pictures and or/videos if appropriate. Also encourage students to dress appropriately for the presentation.

Biographies in Science

Directions:

Assign each student a key historical figure in the world of scientific discovery. Have students research their key figure and develop a biography over the assigned person. Students may either share their biography through a written paper or a Microsoft® PowerPoint® presentation they will present to the class. Encourage students to dress appropriately for the presentation. See the *Biographies in Science Teacher Instruction Sheet* for a list of possible historical figures.