

ELA Unit Plan

Find it! Prove it!: Introducing the Scientific Method

<https://www.sabes.org/pd-center/ela>

Program: Julie’s Family Learning	Class/Instructional Level, Intermediate/4-8 GLE
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PART 1: OVERVIEW <i>(This part is duplicated on the Scope & Sequence for this level.)</i>	
<p>UNIT TOPIC/TITLE</p> <ul style="list-style-type: none"> ▪ <i>Frame titles around topics relevant to adults and related to other content areas (e.g., civics/current events/social studies, science and technology, health, literature, workforce preparation, etc.).</i> ▪ <i>Aim for a pithy topic-related title that can be remembered and used by teachers when referring to the unit.</i> 	<p>Find it! Prove it! Introducing the Scientific Method</p>
<p>TIME</p> <ul style="list-style-type: none"> ▪ <i>Indicate the estimated # of hours (and weeks) required to complete the unit.</i> 	<p>16-22 hours</p> <p>The unit is designed to run for 4 to 5.5 weeks (depending upon whether or not optional activities are included), meeting 2 hours twice each week. Each lesson assumes:</p> <ul style="list-style-type: none"> ● Approx. 1.5 hrs. for the Science/ELA unit (as described in this unit plan) ● Approx. .5 hr. for additional reading instruction in alphabetics, fluency, and vocabulary (suggestions provided in this unit plan)
<p>RATIONALE</p> <ul style="list-style-type: none"> ▪ <i>Explain why this unit is important for adult learners (e.g., how it relates to typical goals of learners at this level).</i> 	<p>This unit comes early in the learning cycle and introduces key ideas and processes central to the study and “doing” of science. Principles, vocabulary, and purposes related to the Scientific Method are explored, laying the foundation for science units that follow. Groundwork is also laid for the importance of identifying and using evidence, in science and in all areas of life.</p> <p>As students work through the unit, they read, write, speak, and <i>think</i> like scientists and users of science: drawing on what they know, asking analytical questions, reading carefully, building background knowledge, following written procedures, keeping a lab journal, crafting lab reports, and presenting results. This unit serves as a vehicle for introducing</p>

	key ELA skills: finding main ideas and summarizing, writing clearly, and using simple strategies to build comfort when speaking to a group.
<p>ESSENTIAL QUESTIONS (optional)</p> <ul style="list-style-type: none"> ▪ <i>Include “open-ended, thought-provoking and intellectually engaging questions that call for higher-order thinking.”</i> 	<ul style="list-style-type: none"> ▪ What counts as “evidence” in science? In reading? In our lives? ▪ How can science help us to understand the world around us and teach us how to ask important questions and seek answers? ▪ How does an understanding of science help us to improve our lives and those of our families?
<p>UNIT OUTCOME / CULMINATING ASSESSMENT</p> <ul style="list-style-type: none"> ▪ <i>Describe, in a few sentences, the desired outcome, focusing on the central texts and end products students will use to show their ELA learning (and understanding of the content topic).</i> ▪ <i>When possible, include one or more authentic performance task(s).</i> 	<p>Students will follow written procedures for experiments and write lab reports in order to develop an understanding of the scientific method and its value. They will also read information on the scientific concepts related to the Scientific Method and to each experiment in order to build background knowledge that will inform their work and help them make connections to their lives.</p> <p>Students show their learning by working in pairs to build background knowledge on a topic, carry out a related experiment, keep a lab journal, write up the lab report, and formally present to the class the following: 1) the overarching question, hypothesis, materials, procedure, and results, 2) how the topic relates to their lives, 3) what they learned about the scientific method.</p>
<p><u>PRIORITY ELA STANDARDS</u></p> <ul style="list-style-type: none"> ▪ <i>List only the ~3-5 level-specific CCRSAE-ELA standards that will be explicitly taught and assessed.</i> ▪ <i>Include standards from across the Reading, Writing, Speaking/ Listening, and Language domains.</i> 	<p>R1C: Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.</p> <p>R2C: Determine the main idea of a text and explain how it is supported by key details; summarize the text.</p> <p>R3D: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> <p>L6C/D: Acquire and use accurately level-appropriate general academic and domain-specific words and phrases.</p> <p>W6C: With some guidance and support, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others.</p> <p>SL4D: Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound</p>

	<p>valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.</p>
<p><u>KEY STUDENT MATERIALS</u></p> <ul style="list-style-type: none"> ▪ <i>List authentic and relevant resources (texts, videos, websites, podcasts...) that students will read, listen to, or view.</i> ▪ <i>Include digital sources and attend to representations of different cultures and perspectives.</i> ▪ <i>Provide text complexity levels.</i> ▪ <i>Include texts with lower and higher text complexity levels to support differentiation.</i> 	<p>“Lab journals” - notebooks/paper folders/Google Drive folders in which students keep background readings, vocabulary definitions, lab reports, and other materials.</p> <p>Science and the Scientific Method</p> <ul style="list-style-type: none"> ● What Is Science? [GLE 4], What Is Science? [GLE 6], OR some other short text introducing “science” ● A Step-by-Step Guide to the Scientific Method (GLE 5; available on Newsela.com – contact your program director for log-in information) OR another text about the Scientific Method. (Note that the options below use different versions of the Scientific Method steps.) <ul style="list-style-type: none"> ○ Readworks.com: The Scientific Method [GLE 5; great chart showing how the steps interact with each other] ○ Six-Way Paragraphs (McGraw Hill): <i>The Scientific Method</i> [GLE 4-5] ○ Timed Readings in Science (McGraw Hill): <i>The Scientific Process</i> [GLE 7.6] <p><i>In this unit, you will choose experiments for students to read and carry out. Starting the 2nd week, each experiment is preceded by a text that builds background knowledge. After an experiment, students may be interested in learning more about the topic, so it is helpful to have additional resources on the ready. Options for all of these are provided below. You are also welcome to choose other topics, experiments, and texts– you will still be able to use the instructional approaches described in this unit.</i></p> <p>NOTES:</p> <ul style="list-style-type: none"> ⇒ <i>Each MA DESE-funded adult education program can access Newsela for free via a state account. Contact your program director to access articles from the site.</i> ⇒ <i>Many experiments are available online but are targeted towards children. Some may also provide explanations for teachers that will interfere with students forming their own hypotheses. Others are embedded within larger texts, and the instructions only (perhaps) will need to be extracted to share with learners. Consider how to make appropriate adaptations for use with ABE students for all texts viewed on the Internet. See the Dyed Flowers (Carnations Experiment) for an example.</i>

⇒ When selecting experiments for this unit, you may choose ones related either to 1) topics students are going to see in more depth in other units (a sampling idea - "here's what we're going to be diving into this year"), or 2) topics students will NOT be seeing in other units but to which you want to expose them.

Photosynthesis

Background Readings:

- [Newsela Text Set](#) (contact your program director for log-in information)
- Timed Readings in Science (McGraw Hill): *Growing from Seeds* [GLE 5]
- Six-Way Paragraphs (McGraw Hill): *An Essential Scientific Process* [GLE 6-7]

Written Procedures for Experiments:

- [Dyed Flowers \(carnations experiment\)](#) [GLE 3]
- [Colour Change Carnations](#) (will need adapting for adult learners) [GLE 5]
- [Make Multicolored Carnations...with Science!](#) [GLE 5]

Additional Resources:

- *PBS Learning Media (videos):*
 - [Teachable Moment: Photosynthesis and Nitrogen Cycle](#)
 - [Photosynthesis](#)

Magnetism

Background Readings:

- Readworks.com:
 - [Magnetism-Magnets: Types and Uses](#) [GLE 4]
 - [Magnetic Fields and the Magnetic Compass](#) [GLE 6]
- Newsela.com (contact your program director for log-in information)
 - [Newsela Magnets and Magnetism](#)
 - [Magnets Attract and Repel](#)
 - [Newsela Infographic](#)

Written Procedures for Experiment:

**The texts below describe demonstrations. To turn these into experiments, ask students a question such as: What will happen to a needle if it is rubbed against a magnet?*

- [Magic Magnetic Needle](#) (will need adapting for adult learners) [GLE 5]
- [How Does a Compass Work \(will need adapting for adult learners\)](#) [GLE 5]
- [Jar Compass](#) [GLE 5]

	<p>Additional Resource:</p> <ul style="list-style-type: none">● YouTube.com: How Do Maglev Trains Work? <p>Plate Tectonics</p> <p>Background Readings:</p> <ul style="list-style-type: none">● Readworks.com:<ul style="list-style-type: none">○ Slow and Steady [GLE 4]○ Plate Tectonics [GLE 6]○ Mount Pinatubo and the Ring of Fire [GLE 8] <p>Written Procedures for Experiment:</p> <p><i>*The texts below describe demonstrations. To turn these into experiments, ask students a question such as “Does the shape of the volcano affect the direction the eruption travels?”</i></p> <ul style="list-style-type: none">● Baking Soda and Vinegar Volcano (will need adapting for adult learners) [GLE 5]● Make Your Own Volcano [GLE 5]● How to Make a Volcano [GLE 5] <p>Additional Resource:</p> <ul style="list-style-type: none">● PBS Learning Media: Mount Pinatubo: Predicting a Volcanic Eruption
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PART 2: IN-DEPTH VIEW

UNIT OBJECTIVES	ASSESSMENT OF OBJECTIVES
<ul style="list-style-type: none"> ▪ <i>These should align with the Priority ELA Standards.</i> ▪ <i>Include objectives for both ELA Skills (directly correlated to the leveled priority standards) and Content Knowledge (related to science, social studies, literature, careers, etc.).</i> 	<ul style="list-style-type: none"> ▪ <i>Consider how teachers will capture evidence for each objective.</i> ▪ <i>How will each objective be assessed through the culminating assessment mentioned in Part 1? (e.g., paper, project, problem, presentation)</i> ▪ <i>(Optional) Attach evaluation tools (e.g., rubrics, checklists) or provide other guidance for teachers.</i>
By the end of this unit, students will be able to:	Students will show their learning by:
ELA Objectives	
1. Use annotation to help identify and reference key details in scientific texts	Submitting the final annotated article used to build background knowledge and/or the annotated written procedures for their final experiment
2. (with a partner) Accurately follow written procedures for an experiment, without teacher prompting.	Completing a lab report on the final experiment with a partner; reflecting on the experience in a presentation to the class
3. Determine the main idea of individual paragraphs	Submitting the annotations for the background knowledge text used for the last experiment, with margin notes indicating the main idea of each paragraph
4. Write a simple summary of a multi-paragraph science text	Writing a simple summary of the background knowledge text on the final lab report
5. Use general academic vocabulary and terms related to the scientific method accurately in their speaking and writing	Using at least 5 terms related to the scientific method correctly in their final lab report and presentation
6. (with a partner) Write a clear and coherent lab report on a Google Doc, following a simple template	Submitting their final lab report
7. Effectively use images and formatted text to share information	Making a presentation that uses at least 2 images and coherent text as visuals
8. Speak clearly and audibly to a group, using simple strategies to guide remarks	Making a group presentation to the class about their final experiment and reflections on the unit
Science Objectives	
1. identify and use the components of the scientific method	Submitting a lab report for the final experiment
2. perform experiments as part of a group	Using relevant vocabulary and discussing what they learned about the scientific method in the final presentation

KEY VOCABULARY

- *Include academic words or phrases (Tier 2) and key content terms (Tier 3), unless teachers are expected to add these at the lesson plan level. Consider that each set of words will require multiple days of practice.*

Tier 3: science, scientific method, evidence, hypothesis, analysis, data, conclusion

**Other Tier 2 vocabulary can be added by the teacher.*

LENSES

- *Include brief clarifications for how the unit addresses each MA priority lens, providing further recommendations for lenses not transparently addressed in other sections of the unit plan.*

Evidence-Based Instruction (including EBRI):

Research in adult reading instruction has found that adult intermediate readers may have idiosyncratic needs in alphabets, fluency, vocabulary, and/or comprehension. Instructional approaches for teaching comprehension strategies and [Tier 3](#) words are emphasized in the unit; however, approximately one-half hour of each 2-hour lesson should be used for targeted alphabets, fluency, and additional vocabulary instruction, based on diagnostic assessment of students.

Teachers are encouraged to use [evidence-based reading instruction \(EBRI\)](#), such as [STAR](#) approaches, as a basis for instruction in the added alphabets, fluency, and [Tier 2](#) vocabulary lessons. Some possibilities include:

- After a topic is introduced each week through the initial “background reading,” provide other texts on the same topic for fluency instruction, using approaches like [Repeated Reading and Collaborative Oral Reading](#).
- Use the suffix “-ist” in “scientist” to introduce a set of suffixes for alphabets/vocabulary instruction.
- Select general academic (Tier 2) words for instruction that will be used to discuss or write about the focus of the unit (science). Well-constructed workbooks and [online lesson plans](#) can aid in planning.

Culturally Responsive Teaching:

- All written materials and videos should be examined to ensure that they include and represent students’ diverse backgrounds.
- Students should increasingly be given choices as they move through the unit, including options to access videos and extra readings on topics of special interest.
- At the beginning of the unit and at least at the end of each lesson, students should be encouraged to reflect on if/how the content covered in the lesson is important in their lives.

Differentiation (especially for English learners and students with learning disabilities):

- Details are provided in the lesson plans and unit design for explicit and scaffolded comprehension and vocabulary instruction. Texts at the low-intermediate level are provided for each lesson, with options given for differentiating for higher-performing students. Additional suggestions mentioned in the lesson plans include sentence frames, different levels of lab reports, and providing choice. Expectations for the final assessment may also be adapted as needed. [See the “Evidence-Based Instruction” section for further examples.]

- As mentioned in the Evidence-Based Instruction section, teachers should also provide separate but related lessons in alphabetics, fluency, and Tier 2 vocabulary, according to students’ diagnosed levels. Extra time is included in the lessons for teachers to provide this additional, customized instruction.

Digital Literacy and Technology:

- Students will use:
 - Google Docs to complete their KWL charts and to complete their final lab report.
 - Google Forms for their Exit Tickets.
 - Google Slides (or other platforms, such as Jamboard or Padlet) and find online images that relate to their final presentation.
- Students will have options for accessing extension videos (e.g., PBS Learning Media and YouTube) and texts.

Remote Instruction:

This unit was originally designed for an in-person classroom. However, there are ways to adapt this unit for remote instruction. Options include (choose one or more):

- Students read the directions for an experiment. Groups work in Google Jamboard where the teacher has written each step on a sticky note and mixed up the order. Students use the written directions to put the steps in the correct order.
- Using Zoom/Google Meets, the teacher carries out an experiment as students read the instructions. Groups identify what was in the wrong order and consequences.
- Using Zoom/Google Meets, students read the experiment and tell the teacher what to do.
- Teacher provides packets of the materials for at least the final experiment. One packet can be sent to one member of the group/pair. Students work together to complete the experiment in virtual breakout rooms, with the student with the materials carrying out the experiment. They can record themselves or take pictures and include these in the final presentation.
- Drop the R3D from the ELA Priority Standards targeted in the unit. Focus the reading instruction on reading for background knowledge prior to and/or following the experiments, and have the teacher use the experiments only for science instruction (no reading connection for those parts of the lessons).

ADDITIONAL RECOMMENDATIONS

- *Include guidance for formative assessments and other texts/resources not included earlier.*
- *What else do teachers need to know? Add these here as well!*

Formative Assessments:

- Review annotated text after each class to ensure students are using text marking effectively or appropriately. Check main idea statements and use those observations to target instruction for the next lesson.
- Have students use the presentation rubric to self-evaluate after they present.
- Include exit tickets for each lesson.

SUGGESTED SEQUENCE OF LESSONS

- Provide a brief overview of what the focus of each lesson would be, as envisioned by the unit developers.

WEEK 1

Lesson 1: What Is Science? Who Is a Scientist? What Does a Scientist Do? (Teacher Modeling; Heavily Scaffolded)

Teacher leads students through a heavily scaffolded use of the first two columns of the KWL (Know–Want to know–Learned) Chart to capture knowledge about “science.” With a text discussing what science is, the teacher models and explains the “Getting the Gist” strategy for finding main ideas and writing summaries, and the class completes the “L” column of the KWL Chart. The lesson begins and ends with a focus on an experiment with carnations, about which students form informal hypotheses about at the end of the class.

*See this lesson plan: [short version](#) and [long version](#).

Lesson 2: What is the Scientific Method? (Teacher Modeling; Heavily Scaffolded)

The class discusses the results of the carnation experiment. The teacher then introduces the Scientific Method (SM), grounding the lesson in students’ experience with the carnation experiment. The teacher leads the class in reading written instructions for the same experiment, tying experimental procedures to other types of written instruction with which students might be familiar. Students use text annotations to help them track steps in the process. The teacher models how to complete a lab report, with students contributing and writing it up on the form provided, incorporating new vocabulary and signal words for sequencing.

*See this [lesson plan](#).

WEEK 2

Lesson 3: Building Background Knowledge with Topic #1 (Small Groups)

The teacher introduces the **1st topic** and draws the class’s attention to the part of the Scientific Method that refers to building background knowledge. The class reviews why it’s important to be knowledgeable before forming a hypothesis and the role that reading skills play in doing and consuming science. Students work in groups to complete the first two columns of the **KWL Chart**, using a text that builds background knowledge about the topic. They then work in groups to use the **Getting the Gist** strategy to identify the main idea of each paragraph. Finally, the class completes the “L” column of the KWL Chart.

Lesson 4: Conducting an Experiment related to Topic #1 (Teacher-led; Heavily Scaffolded)

The teacher introduces the written procedures for an experiment related to the topic explored in Lesson 3, pointing out that whereas students used text annotations to keep track of main ideas and details in the last lesson, in this lesson they will be using text markings now to help them track steps in a process (as they did in Lesson 2). The teacher models (with increasing student participation) circling signal words (*first, second, next*) and marking other parts that might be overlooked. At the appropriate point, the teacher directs students to the lab report form and leads them in filling out the **question**, the **hypothesis**, and the **background reading** sections. The teacher then leads the class in carrying out the experiment, involving the students in reading the directions and accomplishing various procedures. The teacher models jotting down observations in a lab journal where indicated, with students writing on their own. Finally, the teacher writes a lab report with the class (or heavily scaffolds).

WEEK 3

Lesson 5: Building Background Knowledge with Topic #2 (Leveled Groups)

The teacher introduces the **2nd topic** and groups build background knowledge by using the **KWL Chart** and **Getting the Gist** strategy to comprehend a text (more complex, longer than previous texts) at their specific reading levels. Whole class debrief afterwards requires explicit reference to the text to support claims. (NOTE: Groups may read texts on different aspects of the topic, providing an opportunity during the report out for the class to hear different kinds of information about the topic.) If time permits, groups can do the first read-through of the procedures for their experiment, with teacher prompting, annotating as needed to help them track the procedures easily. They might also complete the Question, Hypothesis, and Background Knowledge sections of the lab report.

Lesson 6: Conducting an Experiment related to Topic #2 (Leveled Groups)

The teacher guides students in completing the experiment that may have been started in Lesson 5, ideally providing much less support than in Week 2. Groups write observations in their lab journals. Groups work together to complete a Google Doc version of the lab report that has already been partially filled in by the teacher (to model and save time). The teacher makes the point that in modern times, scientists create electronic records of their work to make it easier to work with others. The teacher provides scaffolding as needed in how to use Google Docs and the groups complete the remaining section(s) of the lab report, perhaps with each member of a group drafting at least one section of the lab report on Google Docs.

WEEK 4

Lesson 7: Building Background Knowledge with Topic #3 (Pairs)

Students work in pairs to start the culminating project. They work independently with the **KWL Chart** and the **Getting the Gist** strategy to build background knowledge on the **3rd topic** (ideally, the teacher can provide options and each pair will have a different topic and/or experiment, if the necessary supplies are available). Pairs do the first read-through of their experiment, annotating as needed to help them track the procedures easily. Pairs complete the Question, Hypothesis, and Background Knowledge sections of the lab report. If time permits and logistics allow, students may get started on their experiments. Students submit annotated article for final evaluation.

Lesson 8: Conducting an Experiment related to Topic #3 (Pairs)

Students work in pairs to follow the written procedures for their experiments (which may have been started in Lesson 7). The teacher provides pointers on the lab reports, based on analysis of formative assessments in previous lessons. Pairs use Google Docs to write up their lab reports.

WEEKS 5-6 (Optional)

Lesson 9: Preparing and Making Presentations

The teacher reminds students of STEP 6 in the Scientific Method (Reporting Results) and explains that scientists often present to each other at conferences. Student pairs will do the same so that the whole class can all increase their knowledge on various topics (assuming different topics were used) or different aspects of the one topic (if different experiments around the same topic were used). The teacher invites discussion of any fears/concerns students have about public speaking, noting that 1) these are very common and 2) there are strategies we can use to deal with these fears. The teacher discusses the type of presentation students will do, choosing from among the following based on students' readiness:

- **OPTION 1:** Students create a poster board presentation, finding images online and typing up text in Google docs, printing them out, and then pasting them to a paper poster board. Students present a 5-minute talk, using notes, during a class Gallery Walk.

- OPTION 2: Students create the equivalent of the poster presentation described in Option 1 but using Padlet.com or Google Jamboard instead of paper poster board.
- OPTION 3: Students create and give a simple PowerPoint presentation instead of a poster presentation.

The teacher explains that the presentation should include: **1) the overarching question, hypothesis, materials, procedure, and results, 2) how the topic relates to their lives, 3) what they learned about the scientific method.** The teacher notes that, since this is a lot of information to share in 5 minutes, students will need to have prepared notes to stay within the time limit. Students are welcome to read straight from their notes, or they can speak from bullet points. The teacher shares a checklist for the presentation and makes a presentation. The class evaluates using the checklist. If time, each pair begins to plan for their presentation, dividing up duties, and starting to create texts and/or look for images.

Lesson 10: Students plan for their presentation. [In order for students to complete the task in the time provided, the teacher needs to set tight parameters around the task. For instance, how many digital images should students incorporate? Is there a template they can use for the presentation/poster board so they're just dropping in information? Note that the presentation prep should be heavily scaffolded if this unit occurs early in the academic year/learning cycle. However, if students are familiar with the digital technology being used, they should be encouraged to make their own decisions about the content and format.

Lesson 11: The teacher reminds students of the importance of projecting one's voice when talking to a group and speaking slowly and clearly. After teacher modeling of some contrasting behaviors (too fast/just right; too soft/audible), pairs practice (with in-person students moving into other parts of the building if possible) and run through their parts. Partners provide feedback on content, volume, pace, and clarity, using the checklist to shape their feedback. In the remaining part of class, each pair makes their presentation and then self-evaluates using the checklist.