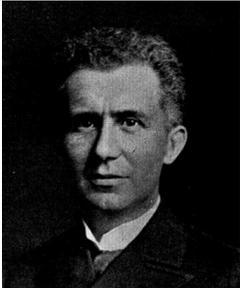


Winter 2011 Teaching with Primary Sources Quarterly Learning Activity – Secondary Level

Scientific Inquiry: What Do Scientists and Inventors Think About?



Emile Berliner. From Library of Congress, *Emile Berliner and the Birth of the Recording Industry, the Library of Congress*. <http://memory.loc.gov/cgi-bin/ampage?collId=berl&fileName=02020101//berl02020101.db&recNum=20>

OVERVIEW

Overview

Students will read and analyze selected notes and correspondence from an inventor. Working together, they will identify specific places in each document that reflect the scientific processes of systematic observation, collecting evidence, reasoning, and developing hypotheses. Finally, students will speculate on what might have happened before the events reflected in the document, how a scientist would design the next phase, and how a scientist could test the results.

Objectives

After completing this learning activity, students will be able to:

- analyze a primary source;
- identify stages of scientific processes; and,
- understand how scientists seek evidence to support hypotheses.

Time Required

Two 45-minute class periods

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Recommended Grade Range

7-8

Topic/s

Science/Scientists

Subject

Science

Standards

McREL 4th Edition Standards & Benchmarks

<http://www.mcrel.org/compendium/browse.asp>

Historical Understanding

Standard 1. Understands the historical perspective

Science

Standard 12. Understands the nature of scientific inquiry

Level III (Grades 6-8)

1. Knows that there is no fixed procedure called “the scientific method,” but that investigations involve systematic observations, carefully collected, relevant evidence, logical reasoning, and some imagination in developing hypotheses and explanations
2. Understands that questioning, response to criticism, and open communication are integral to the process of science (e.g., scientists often differ with one another about the interpretation of evidence or theory in areas where there is not a great deal of understanding; scientists acknowledge conflicting interpretations and work towards finding evidence that will resolve the disagreement)

Credits

Adapted from a lesson plan created by Rebecca E. Prince, Rhodes School, River Grove, Illinois

PREPARATION

Materials

Have these materials ready before the activity.

-Print or prepare to display:

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- Bell's Experimental Notebook, 10 March 1876 <http://www.loc.gov/resource/magbell.25300201/#seq-22.html>
- Print a copy of the following guide for your own use and copies of the tool for student use:
 - *Teacher's Guide to Analyzing Primary Sources* http://www.loc.gov/teachers/usingprimarysources/resources/Analyzing_Primary_Sources.pdf
 - *Primary Source Analysis Tool* http://www.loc.gov/teachers/usingprimarysources/resources/Primary_Source_Analysis_Tool.pdf
- Print sets with copies of each diary page for small groups to study:
Alexander Graham Bell
 - Notebook by Alexander Graham Bell, from 1875 to 0, 1876 (Series: Subject File, Folder: Laboratory Notebook, 1875-1876)
 - March 9 entry <http://www.loc.gov/resource/magbell.25300201/#seq-21>
 - March 11&12 entry <http://www.loc.gov/resource/magbell.25300201/#seq-25>
 - *Evening public ledger*. (Philadelphia [Pa.]) 1914-1942, August 08, 1922, Night Extra Closing Stock Prices, Image 21 <http://chroniclingamerica.loc.gov/lccn/sn83045211/1922-08-08/ed-1/seq-21/>

-Make sets so that each group will be able to study either Berliner or the Wright brothers. Keep the newspaper pages separate:

Emile Berliner

- [Telegram from Emile Berliner to Roy M. Allen, 1926 Nov. 4] [http://memory.loc.gov/cgi-bin/query/r?ammem/berl:@field\(NUMBER+@band\(berl+06010618\)\)](http://memory.loc.gov/cgi-bin/query/r?ammem/berl:@field(NUMBER+@band(berl+06010618)))
- [Letter from Emile Berliner to Roy M. Allen, 1926 Nov. 7] [http://memory.loc.gov/cgi-bin/query/r?ammem/berl:@field\(NUMBER+@band\(berl+06010623\)\)](http://memory.loc.gov/cgi-bin/query/r?ammem/berl:@field(NUMBER+@band(berl+06010623)))
- [Telegram from Emile Berliner to Roy M. Allen, 1926 Nov. 8] [http://memory.loc.gov/cgi-bin/query/r?ammem/berl:@field\(NUMBER+@band\(berl+06010625\)\)](http://memory.loc.gov/cgi-bin/query/r?ammem/berl:@field(NUMBER+@band(berl+06010625)))
- [Telegram from Emile Berliner to Roy M. Allen, 1926 Nov.10] [http://memory.loc.gov/cgi-bin/query/r?ammem/berl:@field\(NUMBER+@band\(berl+06010627\)\)](http://memory.loc.gov/cgi-bin/query/r?ammem/berl:@field(NUMBER+@band(berl+06010627)))
- The American inventor [clipping] (2 pages) [http://memory.loc.gov/cgi-bin/query/r?ammem/berl:@field\(NUMBER+@band\(berl+02020101\)\)](http://memory.loc.gov/cgi-bin/query/r?ammem/berl:@field(NUMBER+@band(berl+02020101)))

Wilbur and Orville Wright

- General Correspondence: Chanute, Octave, 1900 (Page 7, Dec. 20 1900) <http://www.loc.gov/resource/mwright.03063/#seq-7>

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- Diaries and Notebooks: 1903, Orville Wright <http://www.loc.gov/resource/mwright.01007/#seq-9>
- Subject File: Wind Tunnel--Correspondence, 1912-1928, 1938-1946
<http://www.loc.gov/resource/mwright.04175/#seq-5> and
<http://www.loc.gov/resource/mwright.04175/#seq-6>
- *The Minneapolis journal*. (Minneapolis, Minn.) 1888-1939, January 02, 1904, Section 3, Image 28
<http://chroniclingamerica.loc.gov/lccn/sn83045366/1904-01-02/ed-1/seq-28/>

PROCEDURE

1. Display or distribute the first page of Bell’s Experimental Notebook, 10 March 1876, and ask students what they see on the page, and what they think it is about. Select questions from the *Teacher’s Guide to Analyzing Primary Sources* to prompt analysis and discussion. Discuss briefly, and then distribute copies of the Primary Source Analysis Tool and work as a class to record answers in all three columns. Focus students on forming a hypothesis about what event or discovery is described in this primary source. Ask students to form a hypothesis related to what happened before the events recorded in this primary source, and what might happen next. Encourage them to cite evidence from the page to support their thinking.
2. Divide students into small groups and ask them to share their hypotheses.
 - Display or distribute the second page from the entry, and ask students what new information on the page confirms or refutes their hypothesis. Students should add information to the Primary Source Analysis Tool as they analyze the additional page.
 - Ask students to consider both pages and work together to identify specific places in each document that reflect the scientific processes of systematic observation, collecting evidence, reasoning, and developing hypotheses. Students should record their thinking on the Primary Source Analysis Tool or using another method that the teacher dictates.
 - Distribute the pages from March 9 and March 11-12. Working in groups, students should analyze these pages, looking for additional information on Bell’s thinking and use of scientific processes.
 - Students should consider what questions are researchable and record them in the “Further Investigation” section of the Primary Source Analysis Tool for each source analyzed, adding a note about how and where they might research to find answers for each question.

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PROCEDURE (CONT'D)

3. Distribute copies of the *Philadelphia Evening Public Ledger* from August 8, 1922. Ask students to read it and consider what they learn from the article that they did not learn from Bell's notes. Did they find answers to any of the questions they recorded? Did reading the newspaper account raise any additional questions? (Teacher option: individual students or small groups may complete a Primary Source Analysis Tool for the newspaper article.)
4. Give each group a folder of materials from either Emile Berliner or the Wright Brothers. Tell students that they will analyze the set in the same way they analyzed the Bell materials:
 - Have the students analyze each item, recording their thoughts on a Primary Source Analysis Tool, and forming a hypothesis for each about what event or discovery is described in the document. Ask students to form a hypothesis about what happened before the events recorded in this primary source, and what might happen next. Encourage them to cite evidence from the page to support their thinking.
 - Identify specific places in each document that reflect the scientific processes of systematic observation, collecting evidence, reasoning, and developing hypotheses;
 - Remind students to record researchable questions in the "Further Investigation" section of the Primary Source Analysis Tool.
5. Give each group the newspaper report about the inventor they studied. Ask students to read it and consider what they learn from the article that they did not learn from the other documents. (Teacher option: individual students or small groups may complete a Primary Source Analysis Tool for the newspaper.) Did they find answers to any of the questions they recorded? Did reading the newspaper account raise any additional questions?
6. Student groups should report their discoveries to the whole group, using enough detail that students working with a different document set will understand. As a class, discuss what students learned about scientists' thinking and work from studying the document sets. (Teacher option: ask students to respond in writing.)

EVALUATION

- Students' active participation in guided class discussions;
- Students' completed *Primary Source Analysis Tools*;
- Students' active participation in independent group work, including written and verbal presentation of responses to the group questions;

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- As a class, brainstorm and decide upon a final product or performance that will demonstrate groups' new understandings and findings from their investigations into scientific investigations and thinking processes.

EXTENSION IDEAS

Guide students in one or more of the following individual or group activities:

- Create a class timeline using the primary sources from all the groups.
- Research to find answers to one or more of the questions recorded in the “Further Investigation” section.
- Design and conduct an experiment using the scientific processes of systematic observation, collecting evidence, reasoning, and developing hypotheses