

# Using Science Biographies to Teach Research

**Grade Level:** 4<sup>th</sup> Grade (Science and Language Arts)  
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**Length of Unit:** Six one-hour lessons

## I. ABSTRACT

This unit focuses student attention on scientists from the 4<sup>th</sup> Grade *Core Knowledge Sequence* and their contributions to society. Through note taking and outlines, the students will state the historical contributions and explain with reasons the lasting societal impact these four scientists had on people's lives.

## II. OVERVIEW

- A. Concept Objective(s)
  - 1. The student will understand the lasting societal impact and historical contributions of women and men scientists. [Colorado State Standard, Science #5]
  - 2. The student will understand reading to locate, select, and make use of relevant information from a variety of media, reference, and technological sources. [CSS, Reading and Writing #5]
- B. Content from the *Core Knowledge Sequence* [page 106]
  - 1. Benjamin Banneker
  - 2. Charles Drew
  - 3. Elizabeth Blackwell
  - 4. Michael Faraday
- C. Skill Objective(s)
  - 1. The student will use organizational features of printed text (for example, page numbering, alphabetizing, glossaries, chapter heading, and tables of contents, indexes, and captions).
  - 2. The student will take notes, outline, and identify main ideas in resource materials.
  - 3. The student will sort information as it relates to a specific topic or purpose.
  - 4. The student will give credit for borrowed information by telling or listing sources.
  - 5. The student will describe the scientist's contributions, and state the impact these had on people's lives.

## III. BACKGROUND KNOWLEDGE

- A. For Teachers
  - 1. *Pioneers of Science – Michael Faraday*, by Michael Brophy
  - 2. *Elizabeth Blackwell – A Doctor's Triumph*, by Nancy Kline
  - 3. *Black American of Achievement – Charles Drew*, by Robyn Mahone-Lonesome
  - 4. *Dear Benjamin Banneker*, by Andrea Pinkney
- B. For Students
  - 1. Charles Drew – do after the Circulatory System Unit in *Core Knowledge Sequence*.
  - 2. Elizabeth Blackwell – do during the Human Body Unit after sections on preventative measures for healthy bodies.
  - 3. Michael Faraday – do after the Electricity Unit in *Core Knowledge Sequence*.

#### IV. RESOURCES

- A. *Pioneers of Science – Michael Faraday*, by Michael Brophy
- B. *Great Lives: Medicine*, by Robert H. Curtis, M.D.
- C. *What Are You Figuring Now? A Story about Benjamin Banneker*, by Jeri Ferris
- D. *Black Pioneers of Science and Invention*, by Louis Haber
- E. *What Your 4<sup>th</sup> Grader Needs to Know*, by E.D. Hirsch, Jr.
- F. *Elizabeth Blackwell – A Doctor’s Triumph*, by Nancy Kline
- G. *Great Lives: Invention and Technology*, by Milton Lomask
- H. *Charles Drew: Physician*, by Robyn Mahone-Lonesome
- I. *Journey to Freedom – Benjamin Banneker*, by Melissa Maupin (Lesson One)
- J. *Elizabeth Blackwell – The First Woman Doctor*, by Ira Peck (Lesson Three)
- K. *Dear Benjamin Banneker*, by Andrea Pinkney
- L. *Charles Richard Drew, M.D.*, by Linda Trice

#### V. LESSONS

##### **Lesson One: The Life of Benjamin Bannker**

- A. *Daily Objectives*
  - 1. Concept Objective
    - a. The student will understand reading to locate, select, and make use of relevant information from a variety of media, reference, and technological sources.
  - 2. Lesson Content
    - a. Benjamin Banneker
  - 3. Skill Objective(s)
    - a. The student will use organizational features of printed text (for example, page numbering, alphabetizing, glossaries, chapter heading, and tables of contents, indexes, and captions).
    - b. The student will sort information as it relates to a specific topic or purpose.
    - c. The student will give credit for borrowed information by telling or listing sources.
    - d. The student will describe the scientist’s contributions, and state the impact these had on people’s lives.
- B. *Materials*
  - 1. Five different colored index cards for each student
  - 2. White index cards for each student
  - 3. Rings for index cards for each student
  - 4. Appendix A - Partial Outline of Main Ideas (make transparency or handout)
  - 5. Poster board with partial outline on it
  - 6. Copies of Appendix A for each student
  - 7. Main idea strips for poster board – see Appendix B
  - 8. Appendix C - Benjamin Banneker Word Search
  - 9. *Journey to Freedom – Benjamin Banneker*, by Melissa Maupin
- C. *Key Vocabulary*
  - 1. Outline – a short written format to convey an overview of a specific topic
  - 2. Astronomer – a person who studies the stars, moon, and sun
  - 3. Surveyor – a person who measures and maps an area of land to a specific number
- D. *Procedures/Activities*
  - 1. Introduce the unit of researching four scientists. The students will learn about four scientists, their contributions, and their impact on our lives. Show a variety of resources where they will learn how to gather the information.

2. Introduce the topic of an outline and the definition for an outline. Show the Partial Outline of Main Ideas (Appendix A), and explain that these are the major five areas in researching a person's life. Ask the students "how" they would go about finding information. List ideas on board.
  3. Introduce the note cards. The five colors represent the five main ideas in the outline. Assign a color to each one. Tell them that the white ones will be for the bibliography, which they will learn about in Lesson Two. The rings will be put on after they finish with their notes.
  4. Go over all the organizational features of printed text using books, articles, and magazines. Then read *Journey to Freedom-Benjamin Bannaker* to the class.
  5. Then, using these features, with the class, sort the information as it relates to a main idea, and write it on the corresponding color note card. Make sure they put one fact on each card.
  6. When all the notes are finished, show with the poster board and strips where the facts from the note cards go and how (a type of progression). The students should be filling out their outline with the information from their note cards.
  7. When the poster board is finished, show how the outline tells the life story of Benjamin Banneker from birth to death. Make sure you mention that everyone's outline will be different depending on what facts they wrote down.
  8. In the last ten or fifteen minutes of class, discuss the contributions and state the impact these had on people's lives. Write on board or on transparency with overhead.
- E. *Assessment/Evaluation*
1. Informal evaluation of note cards and outline. Use the three-point rubric (Appendix L).

## **Lesson Two: The Life of Charles Drew**

### A. *Daily Objectives*

1. Concept Objective(s)
  - a. The student will understand the lasting societal impact and historical contributions of women and men scientists.
  - b. The student will understand reading to locate, select, and make use of relevant information from a variety of media, reference, and technological sources.
2. Lesson Content
  - a. Charles Drew
3. Skill Objective(s)
  - a. The student will take notes, outline, and identify main ideas in resource materials.
  - b. The student will give credit for borrowed information by telling or listing sources.
  - c. The student will describe the scientist's contributions, and state the impact these had on people's lives.

### B. *Materials*

1. Five different colored index cards for each student
2. White index cards for each student
3. Rings for index cards for each student
4. Appendix A - Partial Outline of Main Ideas (make transparency or handout)
5. Copies of Appendix A for each student
6. Appendix D - Facts of Charles Drew Crossword Puzzle (handout and transparency) with source cited

7. Appendix E - Bibliography Format for Different Sources
8. Appendix F - Additional Sources for a Bibliography
- C. *Key Vocabulary*
  1. Bibliography – cite the source, oral or written, of materials that are used in a oral or written presentation in a formal written format
- D. *Procedures/Activities*
  1. Break up class the in groups of two or three, and review the features of printed text. Each student should have a book (use science or math book). Race to find each feature. Ask questions about where you would go to find each feature. An example would be, “Where would you go to find when the book was published?” The students are to race through the book to find it. They are not to tell the answer out loud.
  2. Then, have them solve the Facts of Charles Drew Crossword Puzzle (Appendix D). When they are finished, go over the correct answers.
  3. Using the Partial Outline of Main Ideas (Appendix A), go over the facts of Charles Drew’s life, and where they would go in the outline. Make sure they use the right color index card for the main idea in each section.
  4. In their groups, they are to fill out their set of index cards and outline while working together. Set a time limit.
  5. Then direct their attention to the source cited on Appendix D. Go over the definition of bibliography and why it is important by law to do so. State that white index cards are to be use for bibliography information only.
  6. Hand out the Appendix E Bibliography Format for Different Sources and go over the different styles. Use books, and articles from a magazine to show where the information comes from to fill in the formats.
  7. Hand out the Appendix F examples, and go over the different examples. Lead with two or three examples by asking them which one to use and what is next to write. Then have them try one on their own and have one student write it on the board.
  8. In their groups, have them finish the handout. They are to check each other’s work to see if the examples are correct. Once the teacher signs them off, they are to write the source for Charles Drew on a white index card.
  9. Using the three-point rubric for the notes and outline and the four-point rubric for the bibliography, go over how to use the rubrics to assess their work.
  10. In the last ten or fifteen minutes of class, discuss the contributions and state the impact these had on people’s lives. Write on board or on transparency with overhead.
- E. *Assessment/Evaluation*
  1. Informal evaluation of note cards, bibliography cards, and outline with the three-point and four-point rubrics (Appendix L).

**Lesson Three: The Life of Elizabeth Blackwell (two one hour sessions)**

- A. *Daily Objectives*
  1. Concept Objective(s)
    - a. The student will understand the lasting societal impact and historical contributions of women and men scientists.
    - b. The student will understand reading to locate, select, and make use of relevant information from a variety of media, reference, and technological sources.
  2. Lesson Content
    - a. Elizabeth Blackwell

3. Skill Objective(s)
    - a. The student will take notes, outline, and identify main ideas in resources materials.
    - b. The student will give credit for borrowed information by telling or listing sources.
    - c. The student will describe the scientist's contributions, and state the impact these had on people's lives.
- B. *Materials*
1. Five different colored index cards for each student
  2. White index cards for each student
  3. Rings for index cards for each student
  4. Appendix A - Partial Outline of Main Ideas (make transparency or handout)
  5. Appendix E - Bibliography Format for Different Sources
  6. Appendix G - Vocabulary Information on Elizabeth Blackwell
  7. Appendix H - Handout on Elizabeth Blackwell (from What Your 4<sup>th</sup> Grader Needs to Know, pages 378-379)
  8. *Elizabeth Blackwell – The First Woman Doctor*, by Ira Peck
- C. *Key Vocabulary*
1. Virus – a disease-causing particle that need living organisms to survive
  2. Bacteria – single-celled organisms that can cause diseases
  3. Hygiene – the practice of maintaining health and cleanliness
  4. Sanitation – public hygiene (water, sewage, drainage, and ventilation)
  5. Nutrition – eating a well-balance diet
  6. Infectious disease – diseases that are easily spread between people by some type of contact
- D. *Procedures/Activities*
1. Write the six vocabulary words from Appendix G on the board, and list what they know. Using Appendix G, go over the information about viruses and bacteria.
  2. Arrange a visit from the school nurse or a speaker from the Red Cross. Have the person speak on infectious diseases and what preventative measures can be taken against them.
  3. When finished, go back to the board and review what was written. Correct any misinformation, and add in areas.
  4. Then introduce Elizabeth Blackwell with Appendix H. Discuss the difficulties she had in becoming a doctor and how it impacted all women.
  5. Using *Elizabeth Blackwell – The First Woman Doctor*, and the partial outline – read sections to class. Discuss the ways of where and how to write the information on the note cards. Use the colored index cards.
  6. Using the Appendix E, go over how to cite the sources used in class (nurse or Red Cross person, and book). Make sure they use the white index cards.
  7. They can work in groups or pairs on the outline.
  8. In the last ten to fifteen minutes of class, discuss the contributions and state the impact these had on people's lives. Write on board or on transparency with overhead.
- E. *Assessment/Evaluation*
1. Informal evaluation of note cards, bibliography cards, and outline using the three and four- point rubrics (Appendix L). Go over with each student.

## **Lesson Four: The Life of Michael Faraday**

### **A. Daily Objectives**

1. Concept Objective(s)
  - a. The student will understand the lasting societal impact and historical contributions of women and men scientists.
  - b. The student will understand reading to locate, select, and make use of relevant information from a variety of media, reference, and technological sources.
2. Lesson Content
  - a. Michael Faraday
3. Skill Objective(s)
  - a. The student will take notes, outline, and identify main ideas in resource materials.
  - b. The student will describe the scientist's contributions, and state the impact these had on people's lives.

### **B. Materials**

1. Five different colored index cards for each student
2. White index cards for each student
3. Rings for the cards for each student
4. Appendix I - "Who is This Story About?"
5. Appendix J - Blank Outline (make transparency or hand out)

### **C. Key Vocabulary**

None

### **D. Procedures/Activities**

1. Introduce the lesson with the short "Who is this Story About?" about Michael Faraday who is labeled as "X" in the story. Lead and discuss the main events based on the five main ideas from the outline.
2. The students will use the index cards to gather information from sources to fill out the outline.
3. Review with them on how to fill out the bibliography card for each source.
4. Then, have the students work independently. Have students complete it for homework if not finished in class.
5. In the last ten to fifteen minutes of class, discuss the contributions and state the impacts these had on people's lives. Write on board or on transparency with overhead.

### **E. Assessment/Evaluation**

1. Assess the note cards for accurate information, bibliography cards, and the completed outline with the three and four-point rubrics (Appendix L).

## **Lesson Five: Timeline for Scientists**

### **A. Daily Objectives**

1. Concept Objective(s)
  - a. The student will understand the lasting societal impact and historical contributions of women and men scientists.
  - b. The student will understand reading to locate, select, and make use of relevant information from a variety of media, reference, and technological sources.
2. Lesson Content
  - a. Benjamin Banneker
  - b. Charles Drew
  - c. Elizabeth Blackwell

- d. Michael Faraday
- 3. Skill Objective(s)
  - a. The student will take notes, outline, and identify main ideas in resource materials.
  - b. The student will describe the scientist’s contributions, and state the impact these had on people’s lives.
- B. *Materials*
  - 1. Appendix K - Markers for Birth and Death
  - 2. Construction paper
  - 3. Markers
  - 4. Bulletin board with timeline from 1700 to 1960
- C. *Key Vocabulary*
  - 1. Timeline – graphic outline
- D. *Procedures/Activities*
  - 1. Introduce the topic of a timeline. Explain that four groups will make and put markers for the major events in each scientist’s life on the timeline.
  - 2. They will start off with a marker for the birth and death of the scientist. Show the handout with the tombstone and banner (Appendix K). They are to use it to make a copy out of construction paper, and mark them with the appropriate scientist’s name, birth and death date.
  - 3. Instruct them to use the outlines from the previous four lessons to mark the time for the events. They can also use the reference sources if they need to. Each group is to decide what events they are going to mark. How many will be determined by how many are in the group (one per person). Do not count the birth and death markers. When they are finished, they are to put them on the timeline.
  - 4. Break the class up into four groups, and give each group a scientist. Have the groups draw the scientist’s name out of a can.
  - 5. After the timeline is finished, have a class discussion about the timeline. Discuss the events, difficulties encountered because of society, the impact each had, and how they relate to us today.
  - 6. Write on the board (or overhead) contributions of each scientist and statements on how these impacted society and history.
- E. *Assessment/Evaluation*
  - 1. Each group will be assessed on their scientist by a visual check that correct event and time was used on the timeline.
  - 2. An informal assessment will be taken on the class discussion for concept #1.

## **VI. CULMINATING ACTIVITY**

- A. Based on Lesson Five, the students will explain with reasons why they think one of the four scientists had the greatest impact on society and history. They will hand in a formal written paper that will be evaluated by the four-point rubric (Appendix M).

## **VII. HANDOUTS/WORKSHEETS**

- A. Appendix A: Partial Outline of Main Ideas
- B. Appendix B: Main Ideas for Strips for Benjamin Banneker
- C. Appendix C: Benjamin Banneker Word Search
- D. Appendix D: Facts of Charles Drew Crossword Puzzle
- E. Appendix E: Bibliography Format for Different Sources
- F. Appendix F: Additional Sources for a Bibliography
- G. Appendix G: Vocabulary Information on Elizabeth Blackwell

- H. Appendix H: Handout on Elizabeth Blackwell, pp. 378-379
- I. Appendix I: “Who is This Story About?”
- J. Appendix J: Blank Outline
- K. Appendix K: Markers for Birth and Death
- L. Appendix L: Three and Four- Point Rubrics
- M. Appendix M: Four-Point Rubrics for Paragraph
- N. Appendix N: Answers for Word Search and Crossword

### VIII. BIBLIOGRAPHY

- A. Blaustein, Dan, and Louise Bulter, Bryce Hixson, Wanda Matthias. *Glencoe Science for 4<sup>th</sup> Grade*. Columbus, Ohio: McGraw-Hill, 1999. 0-02-828315-5.
- B. Brophy, Michael. *Pioneers of Science – Michael Faraday*. New York, New York: The Bookwrite Press, 1990. 0-531-183769.
- C. Curtis, M.D., Robert H. *Great Lives: Medicine*. New York, New York: Charles Scribner’s Son, 1993. (pages 185-194, 219-229) 0-684-19321-3.
- D. Michael Faraday Biographical Info. <http://www.iee.org.uk/publish/faraday>.
- E. Ferri, Jeri. *What Are You Figuring Now? A Story About Benjamin Banneker*. Minneapolis, Minnesota: Carolrhoda Books, 1988. 0-87614-331-1.
- F. Haber, Louis. *Black Pioneers of Science and Invention*. San Diego, California: Harcourt Brace Jovanovich Publishers, 1970. 0-15-208566-1.
- G. Hirsch, Jr. E. D. *What Your 4<sup>th</sup> Grader Needs to Know*. New York, New York: Dell Publishing, 1992. 0-385-31260-1.
- H. Kline, Nancy. *Elizabeth Blackwell – A Doctor’s Triumph*. Berkeley, California: Conari Press, 1997. 1-57324-057-5.
- I. Lomask, Milton. *Great Lives: Invention and Technology*. New York, New York: Charles Scribner’s Son, 1991. (pages 61-67) 0-684-19106-7.
- J. Matlone-Lonesome, Robyn. *Charles Drew: Physician*. New York, New York: Chelsea House Publishers, 1990. 1-55546-581-1.
- K. Maupin, Melissa. *Journey to Freedom – Benjamin Banneker*. United States of America: The Child’s World, Inc., 2000. 1-56766-618-3.
- L. Peck, Ira. *Elizabeth Blackwell – The First Woman Doctor*. Brookfield, Connecticut: The Millbrook Press, 2000. 0-7613-1854-2.
- M. Pinkney, Andrea. *Dear Benjamin Banneker*. San Diego, California: Gulliver Books, 1994. 0-15-200417-3.
- N. Trice, Linda. *Charles Drew – Pioneer of Blood Plasma*. New York, New York: McGraw-Hill, 2000. 0-07-135317-8.
- O. Wolfe, Rinna Evelyn. *Charles Richard Drew, M.D.* New York, New York: Franklin Watts, 1991. 0-531-20021-3.

## **Appendix A: Using Science Biographies to Teach Research**

### **Partial Outline of Main Ideas**

#### **I. Introduction to a specific scientist**

##### A. Early Childhood

1.

2.

##### B. Education

1.

2.

##### C. Accomplishments

1.

2.

##### D. Death

1.

2.

##### B. Impact contributions had on people's lives

1.

2.

#### **II. Summary**

## **Appendix B: Using Science Biographies to Teach Research**

### **Main Ideas for Strips on Benjamin Banneker**

These are suggested facts to fit the previous outline. There are ten facts in sequential order for the teacher to put on strips to fit on the poster board outline. Use the corresponding color of the index cards as you make the strips, and make extra blank strips for students' ideas.

1. His grandmother, Molly Walsh, came from England.
2. His father was a freed slave.
3. He went to school in the winter season.
4. He stops going to school at age 15 because he was needed to work on the farm.
5. He made the first wooden clock.
6. His almanac was published.
7. He died on October 25, 1806.
8. His cabin burned down two days later.

# Appendix C: Using Science Biographies to Teach Research

## Benjamin Banneker Word Search

M A I N D T N O I T A C U D E  
M O S E N O I A L M A N A C X  
A D L F A B M N B I G O L P O  
T N S L L A A Q A F R I C A N  
H A T U Y C J U N E P N L M N  
A L A M R C N I N S U K P A E  
M G R B A O E L E L Z Z U P J  
E N S G M P B L K O V C O B E  
T E L E S C O P E R E M R A F  
I A N I G H T E R C V E X N F  
C L O C K O S N N | E I W O N E  
S A M E R I C A N I O T B A R  
V R E N W O D N A L L E Y K S  
F R S U R V E Y C H I Y W A O  
F L U T E L D F R A N K L I N

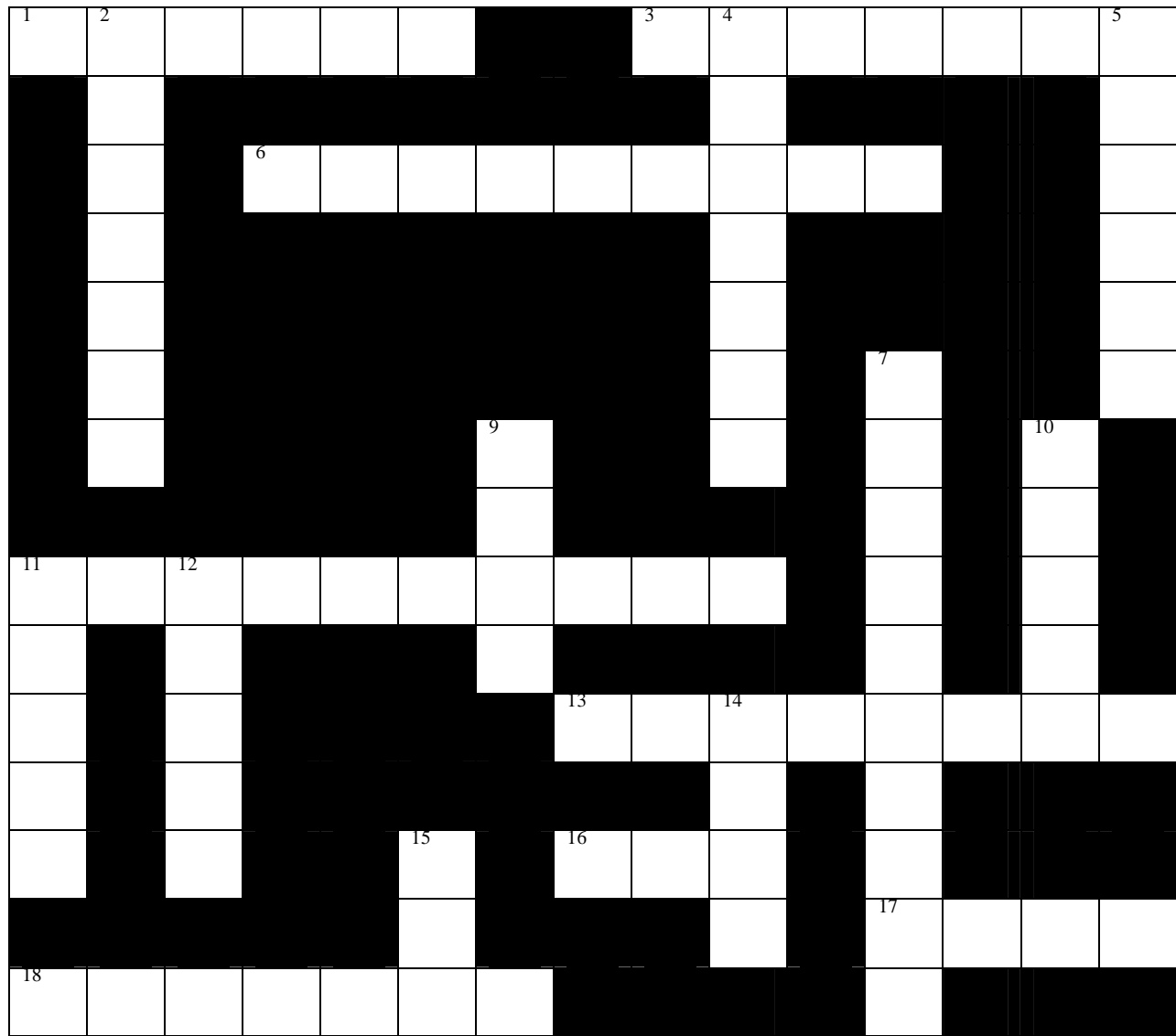
African  
Almanac  
American  
Banna Ka  
Banneker  
Benjamin  
city  
clock  
eclipse  
education

England  
farmer  
flute  
Franklin  
free  
ink  
Jefferson  
landowner  
Maryland  
mathematics

Molly  
night  
puzzle  
quill pen  
stars  
survey  
telescope  
tobacco

## Appendix D: Using Science Biographies to Teach Research

### Facts of Charles Drew Crossword Puzzle



#### Across

1. \_\_\_\_ Hospital in NYC hires the first black doctor.
3. The “unsinkable ship” sinks in 1912.
6. O Blood is the \_\_\_\_\_ donor.
11. He was born on June 3, 1904 in \_\_\_\_\_ D.C.
13. He was appointed assistant director of the \_\_\_\_\_ in 1941.
16. Drew was \_\_\_\_\_ of four doctors in Europe in 1949.
17. He was captain of the track \_\_\_\_\_ at McGill University.
18. Drew was a consultant to the Surgeon \_\_\_\_\_.

*Charles Drew- Pioneer of Blood Plasma* by Linda Trice  
McGraw-Hill Publishing, New York, 2000

#### Down

2. Drew graduated from \_\_\_\_\_ College.
4. It was discovered that \_\_\_\_\_ treats diabetes.
5. He went to medical school in Montreal, \_\_\_\_\_.
7. Drew was an instructor at Howard’s \_\_\_\_\_.
9. Plastic \_\_\_\_\_ for blood replaced glass bottles.
10. Drew toured military \_\_\_\_\_ in Europe.
11. There were 600 African American doctors in the armed forces by the end of World \_\_\_\_\_.
12. First laboratory to \_\_\_\_\_ blood was called a blood bank.
14. Charles Drew \_\_\_\_\_ on April 1, 1950 at age 45.
15. American Medical Association \_\_\_\_\_ (abbreviation)

## Appendix E: Using Science Biographies to Teach Research Bibliography Format for Different Sources

### For all references:

Last name, Initials. "Book chapter/article title," *book/publication title*. City of publisher, State:  
Name of publishing company, year.

### Examples for Books:

#### One author

Browne, Anthony. *Voices in the Park*. New York: DK Publishing, 1998.

#### Two authors

Marshall, James and Sendak, Maurice. *Swine Lake*. New York: Harper Collins, 1999.

### Examples for Articles:

#### One author

Brown, Mary. "Falcons are endangered." *Wildlife*. Boston, MA: Random House, 1998.

#### Two authors

Cameron, Ann and Wolfe, Janet. "Sandy Mystery." *Falcon for Kids*. New York: Random House, 1997.

### Examples for Person:

Peterson, Fred. "*Wildlife Experiences*." Forest ranger. Colorado: Denver Zoo, 2001.

### For on-line material:

Blythe, S. "Why Owls? Value, risk, and evolution," *Kairos* [On-line]. Available URL:  
<http://english.ttu.edu/kairos/1.1/tocnf.html>. 1996

## Appendix F: Using Science Biographies to Teach Research

### Additional Sources for a Bibliography

1. *What Are You Figuring Now?* by Jeri Ferris  
Carolrhoda Books, Inc./Minneapolis  
Copyright 1988
  
9. *Journey to Freedom – Benjamin Banneker* by Melissa Maupin  
The Child’s World  
Copyright 2000
  
3. *What Your 4<sup>th</sup> Grader Needs to Know* by E. D. Hirsch, Jr.  
Dell Publishing/ New York, New York  
Copyright 1992
  
4. *Swine Lake* by James Marshall and Maurice Sendak  
Harper Collins/New York  
Copyright 1999
  
5. “Who’s Afraid of the Big Bad Wolf?” from *Child Life*  
by Children’s Better Health Institute/ Indianapolis, Indiana  
Copyright 1990
  
6. “Pride and Pressure?” by Edward Gross in *Cinescape*  
MVP Entertainment in Lombard, Illinois  
Copyright 1996
  
7. *Arthur’s Birthday* by Marc Brown  
Scholastic Inc. in New York  
Copyright 1989
  
8. *The Adventures of Curious George* by Margaret and H.A. Rey  
Houghton Mifflin Company in Boston  
Copyright 1995

## **Appendix G: Using Science Biographies to Teach Research Vocabulary Information on Elizabeth Blackwell** (*Glencoe Science* pages 50, 54-55)

### **What is a virus?**

A virus is a particle that has things in common with both living and nonliving things. Viruses are like living things in that they are able to reproduce. But they can reproduce only inside a living cell. Viruses are like nonliving things because they do not grow, eat, or respond to their environments.

Viruses need living things to survive. Once a virus attaches to a cell, it invades the cell and begins to make copies of itself. Eventually, the cell occupied by the virus explodes, releasing many new viruses. These new viruses then enter other cells.

### **Examples of Viruses**

Viruses cause measles, colds, chicken pox, and AIDS. Viruses do infect all kinds of living things. Viruses infect bacteria as well as plants and animals. Some plant viruses destroy food crops such as potatoes and tomatoes. Other types can cause cancers in house cats and humans.

Viruses also cause cold sores and chicken pox in humans. Humans can be infected with either of these viruses by touching someone who already has the virus. Hepatitis B and HIV are viruses that can be passed from person to person by blood and other body fluids and on needles carrying the virus. Hepatitis B damages the liver, and HIV can lead to AIDS. AIDS is a disease that eventually destroys the body's ability to fight off diseases that can be life threatening.

### **Treating Viruses**

Most viruses, like the one that causes the common cold, cannot be treated. Other viruses that affect humans, however, can be prevented with vaccines. Vaccines are made from either dead or weak viruses and are given by mouth or by injection. Vaccines cause the body to make antibodies that resist those viruses. Many states require vaccines for polio, measles, and mumps. These diseases can affect children and adults.

### **What is a bacteria?**

Bacteria are single-celled organisms that can cause diseases. There are also bacteria that are helpful. Bacteria are used to make yogurt and some cheeses that we eat. Some bacteria species take in food for energy and move around as many animals do. Others make their own food from sunlight, just as plants do. These bacteria contain the same chemical that plants use in making food. Diseases that are caused by bacteria are treated by antibiotic medicine prescribed by your doctor. Strep throat and ear infections are two types of illness caused by bacteria, which can be treated with antibiotics.

Hygiene – the practice of maintaining health and cleanliness

Sanitation – public hygiene (water, sewage, drainage, and ventilation)

Nutrition – eating a well-balanced diet

Infectious disease – diseases that are easily spread between people by some type of contact

## Appendix H: Using Science Biographies to Teach Research

### Handout on Elizabeth Blackwell

Sometimes a person's whole life can be changed in an instant. Elizabeth Blackwell's life changed one afternoon in 1844 when she went to visit a friend who was dying. As Blackwell later described the scene, the dying woman asked her why she did not think of studying medicine, since she was smart and healthy. When Elizabeth reminded her friend that there were no women doctors, the woman sighed and said that if a "lady doctor" had treated her, she might not be dying.

At that time, it was not considered proper for women to talk about or know anything about the human body. Elizabeth's sick friend had been so ashamed to mention her internal problems to a man that she hid her pain for too long. When she finally sought treatment, it came too late to save her life.

Elizabeth couldn't get the dying woman's suggestion out of her mind. She decided to devote her life to medicine. She was prepared for this radical step because her parents had taught all their sons and daughters to help other people. The Blackwells knew what it was like to be needy. They had once been rich in their homeland of England, but they ran into hard times and immigrated to the United States when Elizabeth was eleven years old. Elizabeth's father died soon after the move, and the family opened a small school to pay their bills.

To earn money for her medical training, Elizabeth took a teaching job in North Carolina. It happened that the principal of the school where she worked was a medical doctor. He had lots of medical books, and Elizabeth was free to read them when her teaching work was done.

She wrote to twenty-nine medical schools asking for admission. Most didn't even reply, and the ones that did were very rude. Friends suggested that she dress up as a man to attend medical school, but Elizabeth wanted to be accepted for what she was. A small medical college in New York finally said "yes." Elizabeth graduated in 1849 at the head of her class, the first woman in the United States to receive a medical degree.

No American hospital would hire Dr. Blackwell, so she went to Europe seeking experience. She was able to get work in a French hospital for women. Then she worked in a famous British hospital. When she returned to the United States she opened her own clinic, the New York Infirmary for Indigent Women and Children. The clinic's patients were very poor; few had ever seen a doctor before.

Elizabeth Blackwell worked at her clinic, wrote articles, and made speeches teaching women about nutrition for babies, the need for exercise and clean air, and the importance of keeping your house and body clean. Her clinic grew into an institution that included a medical college for women. Over the next ninety years, more than a million patients were treated at the clinic she helped start.

Elizabeth Blackwell made many sacrifices. She even lost an eye to infection after caring for a sick baby. Nevertheless, she remained determined to teach women to care for their own bodies and those of their children. She was also determined to open new career opportunities for other women. Today, almost 100,000 American women doctors follow in her footsteps.

(Taken from *What Your 4<sup>th</sup> Grade Needs to Know*, pages 378 – 379)

## Appendix I: Using Science Biographies to Teach Research

### “Who is This Story About?”

This is a true story about a real person who lived in the 1800’s. I am not going to tell you who this mystery person is, or whether this person is a man or woman, or what this person looked like. I am going to tell you that this person experimented with electricity and invented the very first machines to make electricity. For now, we will call this person “X.” While I tell you more, think about how you can find out who “X” is.

“X” was born in England to a very poor family. “X” ‘s father was very ill and could not work. “X” ‘s mother loved “X” and made sure “X” and the other children were happy. She taught the children to read, write, and solve math problems. When “X” was fourteen years old, “X” was apprenticed to a bookbinder and moved to London to live and learn how to repair books.

“X” was a naturally curious person. Reading many of the books in the shop, “X” became fascinated by science. “X” wrote to the scientists at the Royal Institute, a famous science laboratory, to ask for a job. He worked as an assistant and finally got to do some of his won experiments in chemistry and electricity.

In 1831 “X” learned that if you moved copper near a magnet you would get electricity. What if “X” decided to spin a copper disk between the poles of a horse magnet? “X” touched a wire near the center and edge of the disk and discovered that electricity flowed through the wire steadily when the copper disk was turned – the first electric generator! We call it an electromagnet.

“X” didn’t stop there! “X” used electromagnets to invent transformers and find evidence of electrons. “X” remembered early childhood curiosity and became famous for delivering speeches and lectures on science t everyone who wanted to learn. “X” held special lectures for children each Christmas Day, which were crowded with interested listeners. “X” even wrote and published some science books for children.

“X” worked as a scientist at the Royal Institute for more than 50 years. “X” retired in 1865 but the lectures for children are still held each Christmas today. To honor “X” ‘s accomplishment, a unit of electricity was named for “X”. The “farad” measures an amount of electrical charge.

“X” never rode in fancy cars, never appeared on TV commercials, or sang in concerts. All these things were invented after “X” died in 1867. This person became famous by working hard, trying out ideas until discovering how things worked and by sharing wonder with others.

Who is this hero of science?

How can you find out?

## **Appendix J: Using Science Biographies to Teach Research**

### **Blank Outline**

**I.**

A.

B.

C.

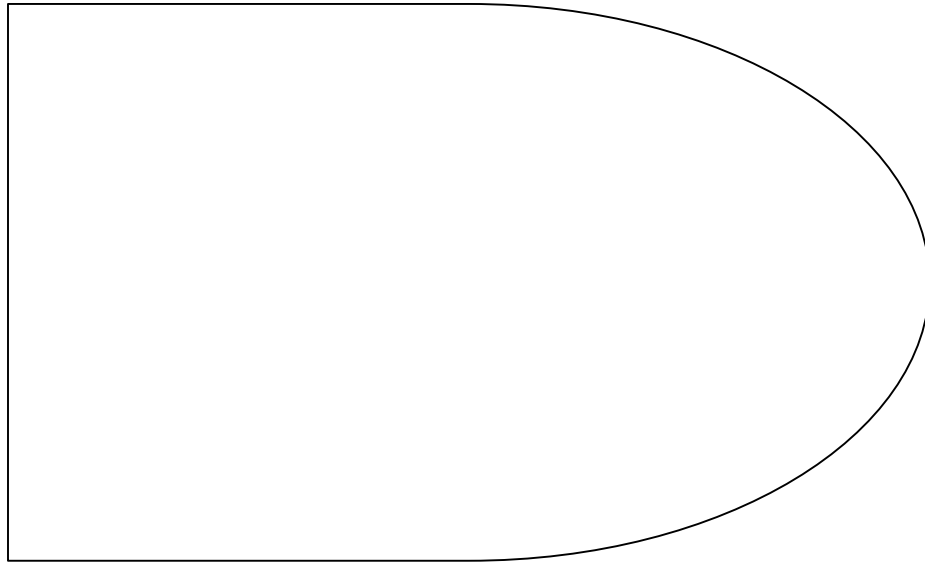
D.

E.

**II.**

# Appendix K: Using Science Biographies to Teach Research

## Markers for birth and death on the timeline



## **Appendix L: Using Science Biographies to Teach Research**

### **Rubrics for Note Cards, Outlines, and Bibliography Cards**

#### **Three-Point Rubric for Note Cards and Outlines**

- 3     The fact is right for the scientist on the note card and spelling is correct.  
      The fact is placed right in the outline and spelling is correct.
- 2     The fact is right for the scientist on the note card but spelling is incorrect.  
      The fact is placed right in the outline but spelling is incorrect.
- 1     The fact is wrong for the scientist on the note card but spelling is correct.  
      The fact is placed wrong in the outline but spelling is correct.
- 0     The fact is wrong for the scientist on the note card and spelling is incorrect  
      The fact is placed wrong in the outline and spelling is incorrect.

#### **Four-Point Rubric for Bibliography Cards**

- 4     right format chosen  
      correct information for format chosen  
      no errors in punctuation and spelling
- 3     right format chosen  
      correct information for format chosen  
      errors in punctuation and spelling
- 2     right format chosen  
      incorrect information for format chosen  
      no errors in punctuation and spelling
- 1     wrong format chosen  
      correct information for format chosen  
      errors in punctuation and spelling
- 0     wrong format chosen  
      incorrect information for format chosen  
      errors in punctuation and spelling

## **Appendix M: Using Science Biographies to Teach Research**

### **Four-Point Rubric for Paragraphs**

#### **Four-Point Rubric for Paragraph**

- 4 The writer establishes and focuses on the purpose of the writing task.  
The writer organizes content and ideas in a logical way, and is fluent  
The writer includes appropriate details to clarify ideas.  
The mistakes in grammar, mechanics, and usage do not detract from clarity and meaning.
- 3 The writer focuses on the purpose of the writing task.  
The writer organizes content and ideas in a logical way.  
Transitions may not be fluent, but details are appropriate to clarify ideas.  
Mistakes in grammar, mechanics, and usage do not detract from clarity and meaning.
- 2 The writer has some awareness of the purpose of the writing task.  
The writer attempts to organize content and ideas.  
The writer is not particularly fluent or omits transitions, but has some details.  
Mistakes in grammar, mechanics, and usage may detract from clarity and meaning.
- 1 The writer is confused in purpose or does not respond to the task.  
The writer shows no organized or logical way with content and ideas.  
The writer includes few or no transitions and details.  
Mistakes in grammar, mechanics, and usage detract from clarity and meaning.
- 0 An unscorable writing sample is blank, unreadable, incomplete, or the student simply refuses to complete the assigned task.

## Appendix N: Using Science Biographies to Teach Research

### Answers for Word Search and Crossword Puzzle

#### Answers to Word Search

M	A	I	N	D	T	N	O	I	T	A	C	U	D	E
M	Q	S	E	N	O	I	A	L	M	A	N	A	C	X
A	D	L	F	A	B	M	N	B	I	G	O	L	P	O
T	N	S	L	L	A	A	Q	A	F	R	I	C	A	N
H	A	T	U	Y	C	J	U	N	E	P	N	L	M	N
A	L	A	M	R	C	N	I	N	S	U	K	P	A	E
M	G	R	B	A	O	E	L	E	L	Z	Z	U	P	J
E	N	S	G	M	P	B	L	K	O	V	C	O	B	E
T	E	L	E	S	C	O	P	E	R	E	M	R	A	F
I	A	N	I	G	H	T	E	R	C	V	E	X	N	F
C	L	O	C	K	O	S	N	N	E	I	W	O	N	E
S	A	M	E	R	I	C	A	N	I	O	T	B	A	R
V	R	E	N	W	O	D	N	A	L	L	E	Y	K	S
F	R	S	U	R	V	E	Y	C	H	I	Y	W	A	O
F	L	U	T	E	L	D	F	R	A	N	K	L	I	N

#### Answers to Crossword Puzzle

<p>Across</p> <ol style="list-style-type: none"> <li>1. <u>Harlem</u> Hospital in NYC hires the first black doctor</li> <li>3. The “unsinkable ship” sinks in 1912. (<u>Titanic</u>)</li> <li>6. O Blood is the <u>universal</u> donor.</li> <li>11. He was born on June 3, 1904 in <u>Washington</u>, D.C.</li> <li>13. He was appointed assistant director of the <u>Red Cross</u> in 1941.</li> <li>16. Drew was <u>one</u> of four doctors in Europe in 1949</li> <li>17. He was captain of the track <u>team</u> at McGill University</li> <li>18. Drew was a consultant to the Surgeon <u>General</u>.</li> </ol>	<p>Down</p> <ol style="list-style-type: none"> <li>2. Drew graduated from <u>Amherst</u> College.</li> <li>4. It was discovered that <u>insulin</u> treats diabetes.</li> <li>5. He went to medical school in Montreal, <u>Canada</u>.</li> <li>7. Drew was an instructor at Howard’s <u>University</u>.</li> <li>9. Plastic <u>bags</u> for blood replaced glass bottles.</li> <li>10. Drew toured military <u>bases</u> in Europe.</li> <li>11. There were 600 African American doctors in the armed forces by the end of World <u>War II</u>.</li> <li>12. First laboratory to <u>store</u> blood was called a blood bank.</li> <li>13. Charles Drew <u>dies</u> on April 1, 1950 at age 45.</li> <li>14. American Medical Association (<u>AMA</u>)</li> </ol>
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