Kansas Inventors and Innovators
Fourth Grade

Developed for
Kansas Historical Society at the
Library of Congress, Midwest Region Workshop
“It’s Elementary: Teaching with Primary Sources” 2012

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Overview
This lesson is designed to teach students about inventors and innovators of Kansas. Students will read primary sources about Jack St. Clair Kilby, Clyde Tombaugh, George Washington Carver, and Walter P. Chrysler. Students will use a document analysis sheet to record information before developing a Kansas Innovator card.

Standards
History:
Benchmark 1, Indicator 1 The student researches the contributions made by notable Kansans in history.
Benchmark 4, Indicator 4 The student identifies and compares information from primary and secondary sources (e.g., photographs, diaries/journals, newspapers, historical maps).

Common Core ELA
Reading:
Benchmark RI.4.9 The student integrates information from two texts on the same topic in order to write or speak about the subject knowledgably.
Benchmark RI.4.10. By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 4–5 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Objectives
Content
- The student will summarize and present information about a Kansas inventor/innovator.
Skills
- The student will analyze and summarize primary and secondary sources to draw conclusions.

Essential Questions
- How do we know about past inventions and innovations?
- What might inspire or spark the creation of an invention or innovation?
- How do new inventions or innovations impact our lives?

Resource Table

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<th>Image</th>
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<td><strong>Former Resident Is Featured In Article</strong></td>
<td>Featured in Article. (Handout 6) This is a newspaper article that talks about Jack Kilby and the invention of the integrated circuit. Document is included at the end of this lesson.</td>
<td>“Former Resident Featured in Article,” Great Bend Daily Tribune 2 September 1961 p. 1</td>
<td>[Microfilm 1240 Kansas State Historical Society]</td>
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<td><strong>Pioneering Inventor Dies</strong> (Handout 7)</td>
<td>This newspaper article was written about Jack Kilby and when he died. Document is included at the end of this lesson.</td>
<td>Hobb, Dale. “Pioneering Inventor Dies,” Great Bend Tribune 22 June 2005, p. 1.</td>
<td>[Microfilm NP 10981 Kansas State Historical Society]</td>
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<td>Side view of a 1928 Chrysler automobile with two women passengers</td>
<td>Library of Congress Prints and Photographs Division Washington, D.C. 20540 USA</td>
<td><a href="http://memory.loc.gov/cgi-bin/query/r?ammem/coolbib:field(NUMBER+@band(cph+3a50421)">http://memory.loc.gov/cgi-bin/query/r?ammem/coolbib:field(NUMBER+@band(cph+3a50421)</a></td>
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Image Description
“Notable Kansans”-M33 lesson from Read Kansas! curriculum

Citation
Read Kansas!
Kansas State Historical Society.

URL
http://kshs.org/teachers/read_kansas/pdfs/m33wccard5.pdf

Newspaper article when W.P. Chrysler died.

Citation
Topeka Daily Capital
(Topeka, Kansas).
19 August 1940 p. 1

URL
[Microfilm T439
Kansas State Historical Society]
George Washington Carver

**Image**

- Portrait of George Washington Carver.
  - Date: between 1930 and 1940
  - **Description**
  - **Citation**
    - "Portrait of George Washington Carver."
    - Item Number: 203669
    - Call Number: B Carver, George Washington "2"
    - KSHS Identifier: DaRT ID: 203669
    - Kansas Memory:
    - Kansas State Historical Society
  - **URL**
    - [http://www.kansasmemory.org/item/203669](http://www.kansasmemory.org/item/203669)

- Tuskegee Institute, Alabama. Dr. George Washington Carver
  - **Description**
  - **Citation**
    - "Dr. George Washington Carver."
    - Library of Congress Prints and Photographic Division
    - Washington, D. C.
    - 20540 USA
  - **URL**

- George Washington Carver, full-length portrait, seated on steps, facing front, with staff
  - **Description**
  - **Citation**
    - "George Washington Carver, full length portrait."
    - Library of Congress Prints and Photographic Division
    - Washington, D. C.
    - 20540 USA
  - **URL**
    - [http://www.loc.gov/pictures/item/2004671560/](http://www.loc.gov/pictures/item/2004671560/)

- George W. Carver, Famed Scientist, Dies in Alabama
  - **Description**
  - **Citation**
    - Manhattan Mercury and Daily Nationalist
    - (Manhattan, Kansas).
    - 6 January 1943 p. 5
  - **URL**
    - [Microfilm T439 Kansas State Historical Society](http://www.loc.gov/pictures/item/2004671560/)

  [attached at the end of this lesson]

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<td>Clyde Tombaugh and Telescope Photograph of astronomer Clyde William Tombaugh, 1906-1997, at age 22 with his homemade 9 inch Newtonian Telescope on his family farm near Burdett, Kansas.</td>
<td>“Item Number: 244 Call Number: B Tombaugh, Clyde *1 KSHS Identifier: DaRT ID: 244”, Kansas Memory. Kansas State Historical Society.</td>
<td><a href="http://www.kansasmemory.org/item/244">http://www.kansasmemory.org/item/244</a></td>
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[attached end of this lesson]
Lesson Plan

Day 1

1. Hand out a computer chip or circuit board. Ask students, “Where might you find computer chips? What might life be like without the invention or innovation of this type of chip and the computer?

2. Introduce the Essential Questions by placing them overhead or on a whiteboard.
   - How do we know about past inventions and innovations?
   - What might inspire or spark the creation of an invention or innovation?
   - How do new inventions or innovations impact our lives?

3. Divide your class into groups of three or four. Cross group students so that anyone who needs assistance is able to get help from within the group. Explain that each group will create an Innovator’s Card (Kansas Innovator) similar to a baseball sports card. They will use the primary documents you will give them in order to create the card.


5. Ask them as a group to brainstorm what they know about Jack Kilby in the first part of the worksheet. After about five minutes, ask students to share what they think they know.

6. Working as a class, fill out the questions on the Document Detective.

7. After ten minutes, review what the students found. Discuss the Kansas Innovator Card (Handout 3) and discuss what information the groups still need in order to fill it out. Collect work for the next day.

Day 2

1. Review the essential questions and what students learned about Jack Kilby from the first session. Divide your class back into groups handing out Kansas Innovator Card (Handout 3), Interviews With Jack Kilby (Handout 4), Featured in Article (Handout 5), and Pioneering Inventor Dies (Handout 6).

2. Assign pairs or individual students in each group to read the three primary sources recording information from them onto scratch paper. After about fifteen minutes, have students look at the Kansas Innovator Card (Handout 3).

3. Discuss what a “Hall of Famer” might be. List ideas the students provide such as the person was important, contributed to others, helped others, etc. Ask each student to fill out the Kansas Innovator Card drawing a picture of Jack Kilby in the corner.
4. When done, ask each group to share one of their **Kansas Innovator Card (Handout 3)**.

**Day 3**

1. Write the names: Clyde Tombaugh, George Washington Carver, and Walter P. Chrysler on the board. Assign each group one of the individuals.
2. Provide copies of primary documents and additional sheets (see end of unit) to each group for the assigned individual as well as a new copy of the **Kansas Innovator Card (Handout 3)**. Have each group to read the material and record information on a piece of scratch paper and complete the new **Kansas Innovator Card (Handout 3)**.
3. Allow groups additional time to research secondary sources and complete the card.
4. Conclude the activity by discussing what impact these Kansas inventors and innovators had on our lives and sharing the newest **Kansas innovator Card**.

**Assessment**

- Evaluate the student’s ability to record facts from several primary texts.
- Evaluate the student’s ability to complete **Kansas Innovator Card**.

**For the Teacher**

When World War II ended, the world of electronics exploded. Because electronics used vacuum tubes, they were large. The first computer, ENIAC, was the size of a school gymnasium. Even with the invention of the transistor in 1947, electronics were still expensive and not very powerful. There was a need for better integrated circuitry that would allow electrical devices to become cheaper, smaller, and more efficient.

Jack Kilby, like many engineers, saw the need for the miniaturization and integration of electronics. While stuck at work while everyone else was on summer vacation, Kilby drew out his idea and then created the world’s first integrated circuit. The invention revolutionized electronics decreasing their cost and size while increasing their power by a thousand fold. Over the next three decades he with others invented the first hand-held calculator, thermal printer for computers, and many other devices that impact our daily lives. With the development of the integrated circuit, the age of technology was launched.

Inventions and innovations may come from an ‘aha’ moment. With Kilby, it came from working systematically on one problem or a need. Other times, inventors
and innovators base their approach on work from another person’s idea but from a different angle.

To engage students, provide opportunities to handle artifacts such as an integrated chip. To obtain them, contact your district’s IT department or a local computer repair shop. The chip is much different than Kilby’s but will provide them something to handle.

Extensions

- Provide students with access to Kansapedia to research and develop other Kansas Innovator Cards.
- Have your students develop an invention that meets a need for today.
- Ask students to write a paragraph describing life as if the integrated circuit was not invented. Discuss how cell phones, computers, music devices might look.
- Challenge students to imagine they are archeologists who are discovering the artifacts associated with one of the innovators such as a held calculator for Jack Kilby, telescope for Clyde Tombaugh, an automobile for Walter P. Chrysler, or a test tube or microscope for George Washington Carver. Ask them to write a paragraph speculating what the object’s use might have been.
Kansas Inventors and Innovators
Photograph of Jack Kilby
(Handout 1)
Kansas Inventors and Innovators
Document Detective
(Handout 2)

Name_________________________________Date_______________________

Focus of research:

What do you think you know about this topic?

Title of Document:

Type of Document: Written document Photograph Cartoon Poster Map Other

Describe:

Purpose of Document. Why was it produced?

Time Period believed to have been produced?

Who produced this document?

Where might it have been produced?

What I learned from this document? What facts and observations did I gain from this document?

What do I still not know or understand about this document? What questions do I still have?
Kansas Innovator Card
(Handout 3)

Name______________________________________

Born________________________Died____________

Innovation or Invention__________________________

How innovation or invention has impacted our lives________

_________________________________________________

_________________________________________________

Our Kansas connection__________________________

_________________________________________________

_________________________________________________

Why this individual belongs in the Kansas Hall of Innovation!

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________
“The Nobel Committee has asked me to discuss my life story, so I guess I should begin at the beginning.

I was born in 1923 in Great Bend, Kansas, which got its name because the town was built at the spot where the Arkansas River bends in the middle of the state. I grew up among the industrious descendents of the western settlers of the American Great Plains.

My father ran a small electric company that had customers scattered across the rural western part of Kansas. While I was in high school, a huge ice storm knocked down most of the poles that carried the telephone and electric power lines. My father worked with amateur radio operators to communicate with areas where customers had lost their power and phone service....

After high school, I studied electrical engineering at the University of Illinois. Most of my classes were in electrical power, but because of my childhood interest in electronics, I also took some vacuum tube engineering physics classes...

In 1958, my wife and I moved to Dallas, Texas, when I took job with Texas Instruments. TI was the only company that agreed to let me work on electronic component miniaturization more or less full time, and it turned out to be a great fit.”
Interview with Jack S. Kilby by Arthur L. Norberg June 21, 1984

KILBY: Well basically, what I did first was sit down and sketch this out in a good deal of detail with colored pencils showing the various layers and progressions, sequences in which these things would be put together. Then, in order to show that you could put all these things together, I took some existing germanium wafers and made what were really almost the equivalent of breadboards of circuits to show that they could be made so that all of the components worked well on a single wafer. So those were kind of the two steps through that period.

Interview with Jack Kilby for Texas Instruments prior to 2000

Interviewer: How did you come up with the idea?
Jack Kilby: Well, before I came to TI (Texas Instruments), I had been working with a company that made packaged circuits, so I was aware that there was a market for that kind of thing. When I saw the capabilities of TI, it kind of opened my eyes to the possibility of doing more on a single semiconductor wafer.

Interviewer: You say you thought it was important at that time. What was going on at that time in electronics to where you had this vision that we needed something much simpler, but much more advanced?
Well, the big products in electronics in the ’50s were radio and television. The first big computers were just beginning to come in and represented the most logical market for us to work in.

Was that one of your goals when you set out to invent the IC was to reduce costs, make things simpler?
Yeah, we expected to reduce the cost of electronics, but I don’t think anybody was thinking in terms of factors of a million.
Former Resident Is Featured In Article. Jack Kilby, son of H.S. Kilby, former president of the Kansas Power Co., here is featured in an article in the Sept. 2 of *Time Magazine*.

Kilby, an engineer with Texas Instruments is credited with developing a tiny electronic device called an integrated circuit which was the subject of the article in the magazine. The new circuits are displacing the transistor as the glamour product of the electronics industry.

The magazine said that the integrated circuits were developed in 1958 by Kilby while he was tinkering in the laboratory during a hot summer vacation.

*(Great Bend Daily Tribune* (Great Bend, Kansas) 2 September, 1961 p. 1)*
Kansas Inventors and Innovators
Pioneering Inventor Dies
(Handout 7)

Inventor of the integrated circuit and Nobel Prize laureate Jack St. Clair Kilby never forget his ties to Great Bend and the heart-of-America values his family adopted hometown instilled in him. Kilby died Monday in Dallas following a short bout with cancer. He was 81. A retired Texas Instruments engineer, he invented the first monolithic integrated circuit which launched the field of modern microelectronics. He received the Nobel Prize in Physics in 2000 for his role in the invention. “It’s absolutely phenomenal what he did,” said Great Bend attorney Glenn Opie, a schoolmate of Kilby’s at Great Bend High School and organizer of various local tributes to him.

(Great Bend Tribune (Great Bend, Kansas) 22 June 2005, p. 1)
Kansas Inventors and Innovators
Walter P. Chrysler, Additional Primary Documents

Walter P. Chrysler Motor Builder Dies At Home
A Former Kansan, His Rise To Fortune is Outstanding Saga. Walter P. Chrysler, 65 who gambled $5,000 in 1908 to buy an automobile on a “hunch” and later made millions manufacturing them died today at his Long Island Estate.

(Topeka Capital Journal (Topeka, Kansas). 19 August 1940 p. 1)
Kansas Inventors and Innovators
George Washington Carver

George Washington Carver, the noted Negro scientist died at 7:30 p.m. today at his home at Tuskegee Institute. Dr. Carver had been in failing health for some months and was confined to his bed for the past ten days. Born of slave parents at Diamond Grove, Mo., he was never sure of his birthdate but once estimated it was about 1874. He became a member of the Tuskegee Institute faculty in 1894 and has been attached to the Negro Institution ever since. Dr. Carver was recognized as one of the outstanding scientists in the field of agricultural research. He discovered scores of uses for such lowly products as sweet potatoes, peanuts, and clay. From the south’s red clay and sandy loam, he developed ink, pigments, cosmetics, paper paint, and many other articles.

(Manhattan Mercury and Daily Nationalist.
(Manhattan, Kansas) 6 January 1943 p. 5)
In school, I excelled in drawing, math, pictures, and objects but not people. Had much difficulty in standard penmanship because this is not conducive to others and vice versa.

While still eleven years old, I came into possession of my first telescope—a very little one. My father found some small lenses one day among some things. He mounted them in a little wooden tube. The size of the principal lens was ¾ inch across, the tube was about 7 inches long and magnified 4 times. I used it a good deal.

“That’s it!” I exclaimed to myself. The change in position—only three or four millimeters in six days—was much too small for an ordinary asteroid... but were the images real... With mounting excitement, I got out the January 21st plates and quickly checked them with a hand magnifier.... There it was, a most unimportant looking, dim, starlike object, which had moved perceptibly from its plate position of the night before. . . . Was the new object not Lowell’s planet x after all?”