A Clever War: 
Scientific and Technological Advances 
in World War I 

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Grade Level:
9 – 12

Objectives:
At the conclusion of this lesson, students will be able to
  - Explain different medical technology and techniques used in World War I
  - Analyze historic photographs in order to determine the new types of technology utilized by armies in World War I
  - Synthesize what inventions were used for by studying the photographs from World War I and connecting those inventions to tools used in modern life
  - Compare and contrast the tools needed to support an army in 1914 with those of previous conflicts
  - Demonstrate their writing skills by completing a group essay in a series of small steps

Guiding Question:
What new developments were armies forced to make during World War I both on and off the battlefield, and why did they make them?

Connections to Common Core:
CCSS.ELA–Literacy.RH.11–12.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.
CCSS.ELA–Literacy.RH.11–12.3 Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.
CCSS.ELA–Literacy.RH.11–12.9 Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.

Connections to C3 Framework:
D2.His.2.9–12. Analyze change and continuity in historical eras.
D2.His.16.9–12. Integrate evidence from multiple relevant historical sources and interpretations into a reasoned argument about the past.

Documents Used:
Primary Sources included in PowerPoint file:

Artifact 1: Trench watch
www.theworldwar.org/lessons
Artifact 2: British CE box respirator, gas mask and carrier
www.theworldwar.org/lessons

Artifact 3: Prosthetic arm
www.theworldwar.org/lessons

Artifact 4: Prosthetic hand
www.theworldwar.org/lessons

Artifact 5: Original ISO white
www.theworldwar.org/lessons

Artifact 6: Pattern 1908 web infantry equipment valise
www.theworldwar.org/lessons

Artifact 7: Gas mask
www.theworldwar.org/lessons

Artifact 8: US buckle knife
www.theworldwar.org/lessons

Photograph 9:
*German airplane with French aviators and soldiers in front*
http://theworldwar.pastperfect-online.com/35156cgi/mweb.exe?request=record;id=C9E363F9-9152-4768-8BD8-342262034321;type=102

Photograph 10:
*British Mark tanks with crib fascines on top of tanks at Cambrai, 1917*
http://theworldwar.pastperfect-online.com/35156cgi/mweb.exe?request=record;id=0F43FA68-ADE4-4DC8-99C1-234380989364;type=102

Photograph 11:
*Soldiers standing outside a 40 and 8 boxcar in France*
http://theworldwar.pastperfect-online.com/35156cgi/mweb.exe?request=record;id=26C3F231-09B9-4182-8510-711969304237;type=102
Photograph 12:  
Two female American Red Cross canteen workers sitting on front of motorcycle posing for group portrait with soldiers  
http://theworldwar.pastperfectonline.com/35156cgi/mweb.exe?request=record;id=9EFACB27-502C-4FCE-9230-273556273112;type=102

Photograph 13:  
Operating room at the Vienna Red Cross Hospital, c.1914–1915  
http://theworldwar.pastperfectonline.com/35156cgi/mweb.exe?request=record;id=9D75D70-B4CE-4843-91D0-425158544020;type=102

Photograph 14:  
A soldier directing traffic at Camp Hancock, Augusta, Georgia  
http://theworldwar.pastperfectonline.com/35156cgi/mweb.exe?request=record;id=68310A94-D301-4B74-B400-356324840693;type=102

Photograph 15:  
U.S. Signal Corps telephone operators in Advance Sector, 3 kilometers from trenches, France  
http://theworldwar.pastperfectonline.com/35156cgi/mweb.exe?request=record;id=A9706BCE-81FC-4EDE-B114-421754561660;type=102

Photograph 16:  
Battery B, 1st Anti-aircraft Battery, Coast Artillery Corps loading an artillery gun  
http://theworldwar.pastperfectonline.com/35156cgi/mweb.exe?request=record;id=9FA49802-17A9-4F91-AC66-912229428108;type=102

Photograph 17:  
Putting a gas mask on a mule. 137th Amb. Co. [137th Ambulance Company]. Camp de Galbert, near Amphersbach, Alsace, Germany. Aug. 31, 1918  
http://theworldwar.pastperfectonline.com/35156cgi/mweb.exe?request=record;id=9A0734EC-B027-40A6-8EEC-272977553428;type=102

Photograph 18:  
Overview: The goal for this lesson is to explain that World War I saw a new method of warfare (trench warfare) which most people know about. But it also led to significant advances in science and technology. We want to figure out what other advances were implemented during World War I. To accomplish this, the students will review a series of primary photographs and artifacts that will illustrate new aspects of warfare. Their ultimate goal is to write an essay that will explain how warfare changed from a technical perspective.

Time: One 90-minute block or two 45-minute classes

Materials:
- PowerPoint of artifacts and photographs
- Graphic Organizer
- Essay prompt
- Photograph Analysis Sheet from the Library of Congress (if desired)
- Computer/Google docs (if possible)

Lesson Preparation:
- Print one copy of photographs per group
- Copy one IQ Test per student
- Print out one Graphic Organizer per group
- Be sure each group has either notebook paper or computer access for the writing portion
- Print one copy of Library of Congress Photograph Analysis Sheet and per group

Procedure:
- Anticipatory Set – Hand out copies of IQ test for students to take. Students should complete the test to the best of their ability.
  - Note: It is a strange test, from pre–1920 America, so do not let them get too discouraged.
  - After they have a chance to complete it, share the answers and see how they did. Explain that this is an IQ test used for soldiers at the beginning of World War I, as America had to find new ways to find competent soldiers to lead their rapidly assembled army.
• **Sorting the Photo Evidence** – Put students into groups of three or four. Distribute organizers to students and distribute photographs (one set per group). For extra analytical purposes, you could also distribute the two Photograph Analysis Sheets, one per group, as a guide.

• Using the graphic organizer, students should indicate what the photograph is showing (what object/action) and to then sort it according to which category it would fall under.

• After they have sorted all of the photographs, each student in the group should choose a category for which he or she will be responsible.

• **Paragraph Writing** – Once students have a category, they will each write a paragraph explaining what new advances were made in their category and why they were made. They should focus on writing structure: a good topic sentence that indicates a general idea of how their area changed and at least three supporting pieces of evidence from the photographs in their category.

• If you are using two 45-minute blocks, the first will likely end at some point during paragraph writing.

• When the group has finished all paragraphs, they should put them together as if they were the body paragraphs of the essay.

• **Writing a Group Essay** – Together the group should write an introduction and solid thesis statement to answer the following prompt: “What new developments were armies forced to make during World War I both on and off the battlefield and why did they make them?”

• Following the construction of an introductory paragraph, they will then add transitions between their paragraphs and complete a conclusion. Together, they will have written an essay as a group, which the teacher can then collect and use to measure comprehension of the subject material.

• For technology purposes, I would recommend (if the hardware is available) typing on Google docs. That way the students’ paragraphs appear all at once, and the full essay is more or less typed after they have written their individual paragraphs. Students can quickly and efficiently peer edit their work before submission. If using a computer, students could also pull selected pictures into the Word document in order to make it appear more like a magazine layout.

**Assessment Materials:**

• The whole lesson revolves around the following essay prompt: “What new developments were armies forced to make during World War I both on and off the battlefield, and why did they make them?” Students are working together to create
an essay that answers this question, and the teacher can stop at any point and grade paragraphs, or simply grade the completed product at the end of the class.

**Methods for Extension:**

- Once all students have written their paragraphs, the group could work together to write a final paragraph that indicates how some of these innovations became parts of not just today's military, but today's everyday life. (Example: radios for military or civilian use, water purification, hazmat suits, etc.) That could feasibly turn into a quick research day or a larger project.

- A more abbreviated version of this activity (a "bell-ringer" the following day) could consist of a teacher making a brief slide show of modern-day tools – like the ones listed earlier in this paragraph – that do the same jobs that the innovations in World War I were intended to do.

**Adaptations:**

- This lesson is designed to be a writing workshop that challenges students to work with source material, and is intended to be as flexible as possible. You can easily make this more or less advanced. For advanced students, they can make their own categories based on the photographs instead of using assigned categories.

- Prompt students to think beyond the pictures, asking, “Here are some of the advances that armies made during the war. What other adjustments would they have to make based on what you know about trench warfare? What other sorts of inventions would have helped the soldiers in the trenches?” After they brainstorm, they can write another paragraph to add to their essay.

- If students struggle with the pictures, I like to break it down to the basics by using the photograph analysis sheet from the Library of Congress. This organizer helps students to discuss piece-by-piece what they are seeing, and from there they can usually get to a more thoughtful conclusion.
Bibliography

Primary Sources


http://theworldwar.pastperfect-online.com/35156cgi/mweb.exe?request=record;id=9EFACB27-502C-4FCE-9230-273556273112;type=102.


Secondary Sources


IQ Tests Go to War—Measuring Intelligence in the Army

The army’s use of intelligence tests during World War I lent new credibility to the emerging profession of psychology, even as it sparked public debate about the validity of the tests and their implications for American democracy. Intelligence testing influenced American society long after the war that had launched it. The tests were revised for use in schools and promoted the “tracking” systems of segregating students into ability groups according to test results. Intelligence testing fueled eugenics programs and were also widely invoked by those who pressed successfully to restrict immigration to the United States. Match your wits with World War I-era recruits with questions from actual army intelligence tests.

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bull Durham is the name of a</td>
<td>A. chewing gum</td>
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<tr>
<td></td>
<td>B. aluminum ware</td>
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<td></td>
<td>C. tobacco</td>
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<td></td>
<td>D. clothing</td>
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<td>2. Seven-up is played with</td>
<td>A. rackets</td>
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<td></td>
<td>B. cards</td>
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<td></td>
<td>C. pins</td>
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<td>D. dice</td>
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<td>3. The Merino is a kind of</td>
<td>A. horse</td>
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<td></td>
<td>B. sheep</td>
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<td></td>
<td>C. goat</td>
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<td>D. cow</td>
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<td>4. The most prominent industry of Minneapolis is</td>
<td>A. flour</td>
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<td></td>
<td>B. packing</td>
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<td></td>
<td>C. automobiles</td>
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<td></td>
<td>D. brewing</td>
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<tr>
<td>5. Garnets are usually</td>
<td>A. yellow</td>
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<td></td>
<td>B. blue</td>
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<td></td>
<td>C. green</td>
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<td></td>
<td>D. red</td>
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<td>6. The Orpington is a kind of</td>
<td>A. fowl</td>
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<tr>
<td></td>
<td>B. horse</td>
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<td></td>
<td>C. granite</td>
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<td></td>
<td>D. cattle</td>
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<td>7. George Ade is famous as a</td>
<td>A. baseball player</td>
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<td></td>
<td>B. comic artist</td>
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<td></td>
<td>C. actor</td>
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<td></td>
<td>D. author</td>
</tr>
<tr>
<td>8. Soap is made by</td>
<td>A. B. T. Babbitt</td>
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<tr>
<td></td>
<td>B. Smith &amp; Wesson</td>
</tr>
<tr>
<td></td>
<td>C. W. L. Douglas</td>
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<tr>
<td></td>
<td>D. Swift &amp; Co.</td>
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<td>9. Laura Jean Libby is known as a</td>
<td>A. singer</td>
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<tr>
<td></td>
<td>B. suffragist</td>
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<tr>
<td></td>
<td>C. writer</td>
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<td></td>
<td>D. army nurse</td>
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<td>10. An air-cooled engine is used in the</td>
<td>A. Buick</td>
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<td></td>
<td>B. Packard</td>
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<tr>
<td></td>
<td>C. Franklin</td>
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<td></td>
<td>D. Ford</td>
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<td>11. A house is better than a tent, because</td>
<td>A. it costs more</td>
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<td></td>
<td>B. it is more comfortable</td>
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<td></td>
<td>C. it is made of wood</td>
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<td>12. Why does it pay to get a good education?</td>
<td>A. it makes a man more useful and happy</td>
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<td>B. it makes work for teachers</td>
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<td></td>
<td>C. it makes demand for buildings for schools and colleges</td>
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</tbody>
</table>
### 13. If the grocer should give you too much money in making change, what is the right thing to do?
- A. buy some candy off him with it
- B. give it to the first poor man you meet
- C. tell him of his mistake

### 14. Why should food be chewed before swallowing?
- A. it is better for the health
- B. it is bad manners to swallow without chewing
- C. chewing keeps the teeth in condition

### 15. If you saw a train approaching a broken track you should
- A. telephone for an ambulance
- B. signal the engineer to stop the train
- C. look for a piece of rail to fit in

### 16. If you are lost in a forest in the daytime, what is the thing to do?
- A. hurry to the nearest house you know of
- B. look for something to eat
- C. use the sun or a compass for a guide

### 17. It is better to fight than to run, because
- A. cowards are shot
- B. it is more honorable
- C. if you run you may get shot in the back

### 18. Why should all parents be made to send their children to school? Because
- A. it prepares them for adult life
- B. it keeps them out of mischief
- C. they are too young to work

### 19. Why do some men who could afford to own a house live in a rented one? Because
- A. they don’t have to pay taxes
- B. they don’t have to buy a rented house
- C. they can make more by investing the money the house would cost

### 20. Why is beef better food than cabbage? Because
- A. it tastes better
- B. it is more nourishing
- C. it is harder to obtain
Answers for the Summer Puzzle

1. C. tobacco
2. B. cards
3. B. sheep

4. A. flour
5. D. red
6. A. fowl

7. D. author
8. A. B. T. Babbitt
9. C. writer

10. C. Franklin
11. B. it is more comfortable
12. A. it makes a man more useful and happy

13. C. tell him of his mistake
14. A. it is better for the health
15. B. signal the engineer to stop the train

16. C. use the sun or a compass for a guide
17. B. it is more honorable
18. A. it prepares them for adult life

19. C. they can make more by investing the money the house would cost
20. B. it is more nourishing
By this point, we know that World War I settled into trenches pretty quickly. But did you know that World War I was a testing ground for many new inventions? Many of these were new weapons, but there were also many non-lethal advances made at the time of the Great War. The packet of pictures that have features several different types of technology that arrived around World War I. You should identify what technology is in the picture, and then put the picture into one of the categories below. Does each picture show you a new weapon, medical technique/device, or invention that would help armies with transportation and communication? If a picture seems like it can’t be categorized, you can put it in the Wild Card category.

Once you and your group have sorted all of the pictures, you will be given instructions for your next step.

<table>
<thead>
<tr>
<th>Weapons</th>
<th>Medical Advancements</th>
<th>Transportation / Communication</th>
<th>Wild Card</th>
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Photo Analysis Worksheet

Step 1. Observation

A. Study the photograph for 2 minutes. Form an overall impression of the photograph and then examine individual items. Next, divide the photo into quadrants and study each section to see what new details become visible.

B. Use the chart below to list people, objects, and activities in the photograph.

<table>
<thead>
<tr>
<th>People</th>
<th>Objects</th>
<th>Activities</th>
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<tr>
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Step 2. Inference

Based on what you have observed above, list three things you might infer from this photograph.

Step 3. Questions

A. What questions does this photograph raise in your mind?

B. Where could you find answers to them?
Military Supplies: A lot of thought was put into supplying the basic needs of thirty soldiers. This mobile cart (lower deck) supplied some of which the microorganisms had largely been killed by ultraviolet light. A similar cart was used in the French-Moroccan war of 1911-1912. [Less] [Link to this slide]

Scientific American, July 26, 1932

Battlefield Light: Illuminating shells as designed by Krupp in 1933. The shells arrived at a bright flash and a parachute and could light up a field of battle for several minutes. During World War I soldiers caught in the open when one of these shells went off were suffocated if they stayed perfectly still. Any movement attracted machine gun fire. [Less] [Link to this slide]

Scientific American, October 11, 1933

Zeppelin Mines: German military offices watch as this dirigible fighting machine, spotting machine guns and enemy targets, flies to the shows in 1913, one year before war broke out in Europe. The reality was that although mines in World War I caused some casualties and much alarm, they were not an effective weapon. [Less] [Link to this slide]

Scientific American, April 2, 1933

Bouncing Mines: From the point of view of military inventors, Nils Petersen, a scientist of Norway, came to these conclusions: Mines are effective as long as they can be used against the enemy, but they are not effective against the population. [Less] [Link to this slide]

Scientific American, December 27, 1933

Military Medicine: In recent years, the increasing number of soldiers killed in action has led to the development of better medical care. The American Association for the Advancement of Medical Research is playing a vital role in the advancement of medical knowledge. [Less] [Link to this slide]

Scientific American, December 20, 1933

Pigeons for Communication: Radio communication could be traced and was sometimes unreliable. However, pigeons were used extensively and were used in World War II. They were sometimes kept in wooden cages carried by mailmen, such as this one in France in 1939. [Less] [Link to this slide]

Scientific American, July 12, 1933