Heroes of Progress, Pt. 34: Alan Turing

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Lesson Overview

Featured article: Heroes of Progress, Pt. 34: Alan Turing by Alexander C.R. Hammond

In this lesson, students will learn about the tragic life of mathematical genius and key founder of theoretical computer science and artificial intelligence, Alan Turing.

Not only is Turing known as the 'Father of Computer Science' for his triumphs in both theoretical and applied computing, but his code-breaking work during World War II likely shortened the conflict and saved the lives of millions.

Warm-up

Watch this short video about the enigma code.

- In partners, small groups, or as a whole class, have students respond to the following questions:
  - What was the enigma machine and why did the Germans think that its code was unbreakable?
  - Why did the Poles believe that it was important to decode the enigma machine during the late 1930s?
  - How were the discoveries of Polish codebreakers transferred to the British and French intelligence services?

- Alan Turing and the team at Bletchley Park were able to break the German enigma code after a stroke of insight. Watch this clip from the award-winning 2014 biopic "The Imitation Game" for a dramatic (and historically-condensed) rendition of their important discovery. Then discuss the following questions:
  - Hitler's cult of personality and Nazi dogma allowed Turing and his team to break the enigma code. Which habit of enigma operators was Turing and his team able to exploit? Specifically, what were the exact words the Nazis normally included in messages?
  - In the clip, Turing is shown using a large machine. Make a prediction. How was the invention of this machine able to help break German codes and shorten the war?

Questions for reading, writing, and discussion

Read the article, and then answer the following questions:

- What has been the long-term significance of Turing's 1936 academic paper "On Computable Numbers, with an Application to the Entscheidungsproblem" (i.e., decision problem)? How do the ideas in this document continue to affect our everyday lives?

- What was the name of the machine that Turing invented that significantly helped in decoding the Nazi enigma code? What did this device do?

- Turing's brilliance was shown when he personally broke the code used by the German submarine fleet in 1941. Think about the larger context of World War II. Why was the breaking of that code of particular importance to Great Britain at that time? (The answer is not in the article; you must use your historical background knowledge.)

- In the chart below, write a summary of Turing's achievements in each field. In the right column, describe what you believe have been the most important impacts of each achievement.

	What were Turing's seminal achievements in this field?	What were the most important impacts of that achievement?
Theoretical computing		
Enigma code breaking		
Hands-on creation of computers		

- Despite his heroic service to the Allied cause during World War II and his pioneering work on the world's first computers during the late 1940s, Turing was publicly vilified in 1952 for engaging in homosexual activity and was cruelly punished by the British justice system. Tragically, Turing committed suicide in 1954 at the age of 41.

In subsequent years, how have Turing's achievements been recognized? In what ways has the government of the United Kingdom tried to make amends for the savage injustice meted out to Turing?

Extension Activity/Homework

- **Make a Forecast**
  Almost 100 years ago, Alan Turing came up with the theoretical framework for modern computers. His academic work was the foundation for the laptops and smartphones that we now rely on every day.
  Watch this short video on how Turing "accidently" invented the computer, and then respond to the following prompt:
  How will computers evolve over the next 100 years? In a short essay, make a forecast about the types of tasks you think computers will be able to accomplish over the next century. Then describe how these advances will affect your everyday life. Write in detail about at least three changes you believe will occur as well as the specific ways people's everyday experiences will change as a result.

- **Reflect on Your Own Reaction**
  How did reading about Turing's life story affect you?
  In a short reflective piece—either a paragraph, poem, song, drawing, or other creative medium of your choice—describe your personal reaction to Turing's life story.
  Here are some ideas to get you started.
  - What is one word to capture your feeling after reading the article? How does that word capture your emotions?
  - What is one question you still have about Turing's life and legacy?
  - What is one quote or detail from the article that particularly resonated with you? Why?