

UNIT 9

TEACHING THIS
INVESTIGATION

Framing problem/ question	To what extent has the Modern Revolution been a positive or a negative force?		
Why do historians, scientists, and others care about this question?	<p>The “Modern Revolution” is the most recent threshold of increasing complexity, according to David Christian. It is defined by faster rates of innovation, greater exploitation of fossil fuels, and more complex global exchange networks. Overall health and life expectancies have improved, and collective learning has broadened. But modern dangers include far deadlier weapons and man-made threats to the environment. Christian argues that each threshold makes the Universe more fragile, but also more complex and interesting. This investigation explores that idea by asking, To what extent has the Modern Revolution been a positive or a negative force?</p>		
Why should teachers and students of big history care about this question?	<p>This investigation includes the final writing assessment. Students use the documents in the Investigation Library and their own knowledge to craft an argument about whether the Modern Revolution has been a positive or a negative force. The documents provide students with information about changes in population, governments, health, inventions, and literacy.</p> <p>Note: This question does not specify what or whom the Modern Revolution has affected most profoundly. Students could discuss the Modern Revolution’s impact on the environment or the economy; on their family or humanity; on the present or the future.</p> <p>Students must write their essay in class. We encourage you to give the question and texts to them in advance. Please allow about 40 minutes for students to write a four- or five-paragraph, evidence-based argument about whether the Modern Revolution has been a positive or a negative force.</p>		
What texts are in the Investigation Library?	Secondary Sources	<ul style="list-style-type: none"> • Population trends • Urban population growth • Literacy and education • Inventions and discoveries • Vaccines and disease 	<ul style="list-style-type: none"> • Spread of democracy • Wars and killings by governments • Carbon dioxide levels over the last 10,000 years
What is the students’ project or prewriting task?	<p>Complete the table: We provide a table to help students weigh the evidence in the various texts. Completing the table should help students “see” both the positive and the negative consequences of the Modern Revolution, by, for example, revealing the implications of a single innovation, such as plastic and plastic bottles. The table will also help students link their information to specific documents, making it easier to use sources as well as information in writing their arguments.</p>		
What is the students’ writing task?	<p>Write an argument: This is a required, in-class writing assessment that has students answer the question “To what extent has the Modern Revolution been a positive or a negative force?”</p> <p>In this in-class writing assessment, you can allow students to use their notes, the documents, <i>and</i> their completed tables. Remind students to use relevant disciplinary or big history concepts, to reference documents, and to acknowledge opposing viewpoints in their essay.</p>		

Analysis of texts in this investigation

Text Name	Lexile Measure ¹	Common Core Stretch Grade Band ²	Mean Sentence Length	Flesch Ease ³
Introduction	1180	6–9	17.7	45.5
Steps in the investigation	800	5–8	11.45	58.8
TEXT 01 Population trends	1040	6–8	14.67	51.1
TEXT 02 Urban population growth	1000	6–8	14.56	35.8
TEXT 03 Literacy and education	1030	6–8	15.08	42.7
TEXT 04 Inventions and discoveries	820	4–5	12.50	58.7
TEXT 05 Vaccines and disease	990	6–8	14.09	40.3
TEXT 06 Spread of democracy	1120	6–8	18.42	48.6
TEXT 07 Wars and killings by governments	1130	6–8	17.83	53.4
TEXT 08 CO ₂ levels over the last 10,000 years	1080	6–9	14.7	51.2

¹ Lexile measure indicates the reading demand of the text in terms of its semantic difficulty and syntactic complexity. The Lexile scale generally ranges from 200L to 1700L. The Common Core emphasizes the role of text complexity in evaluating student readiness for college and careers.

² We are using the Common Core “stretch” grade bands. The Common Core Standards advocate a “staircase” of increasing text complexity so that students “stretch” to read a certain proportion of texts from the next higher text complexity band.

³ In the Flesch Reading Ease test, higher scores indicate that the material is relatively easy to read while lower scores indicate greater difficulty. Scores in the 50–70 range should be easily understood by 13- to 15-year-olds, while those in the 0–30 range are appropriate for university graduates.

9

INVESTIGATION

To what extent has the Modern Revolution been a positive or a negative force?

The Modern Revolution is the most recent threshold of increasing complexity, according to David Christian. He argues that faster rates of innovation, new energy sources, and more complex networks of global exchange have made our world more complex and interesting, as well as more fragile and dangerous.

Expanding networks have accelerated collective learning, generated new technologies, and improved means of communication, transportation, and food production. These have had a dramatic impact on human life, linking the globe like never before and providing cures for some of the most life-threatening diseases. People on average are living longer and have greater access to resources and education. However, the Modern Revolution has also brought great new weapons of destruction and new environmental threats.

Has the Modern Revolution been positive or negative? Has it been good or bad?

What do you think? This investigation asks you to use the documents in the Investigation Library and your understanding of the Modern Revolution to weigh its impact. We have provided you with a table to help you analyze the evidence and make up your mind. You will be able to use the table, your notes, and the documents in the Investigation Library to write a four- to five-paragraph essay showing what you think about the impact of the Modern Revolution.

You will write this essay in class, arguing the extent to which you think the Modern Revolution has been a positive or a negative force. Make sure to support your claims with logic and evidence.

THE STEPS IN THIS INVESTIGATION

To what extent has the Modern Revolution been a positive or a negative force?

EXPLORE	Begin with your initial <i>conjectures</i> (best guesses) about whether the Modern Revolution has been a positive or a negative force. Has it had a good or a bad impact? Use your journal to capture your thinking about the Modern Revolution.
RESEARCH	<p>Read the materials in the Investigation Library. What do the texts and data tell you about the impact of the Modern Revolution? How do they support, extend, or contradict your initial conjectures? Do they support, extend, or contradict each other?</p> <p>We have provided a table for you to use to help you capture information and organize your thinking.</p>
SHOW YOUR THINKING	<p>So, now what do you think? To what extent has the Modern Revolution been a positive or a negative force? Has it had a good or a bad impact?</p> <p>Review your initial conjectures, the documents, and your notes on the documents, the other course materials, and your table.</p> <p>Then write a four- to five-paragraph essay that shows your thinking about the degree to which the Modern Revolution has been a positive or a negative force, with a good or bad impact.</p> <p>Please make sure to state your position and how you arrived at that position. In your essay, you should use</p> <ul style="list-style-type: none">• Use big history ideas and content• Acknowledge opposing viewpoints and why you reject them• Support your thinking with logic and evidence• Write a concluding paragraph to close your argument <p>Investigations do not end with your answer. Read or discuss your classmates' essays to compare their thinking with yours. Do their arguments support, extend, or challenge your thinking?</p>

To what extent has the Modern Revolution been a positive or a negative force?

In your research, use the table to help capture information and to organize your thinking.

Trends / events	Trend description	Why positive / good?	Why negative / bad?	Source of information
TEXT 01 Population trends				
Life expectancy rates				
Fertility rates				
Population size				
TEXT 02 Urban population growth				
TEXT 03 Literacy and education				
Increase in % and number of literate people				
Literacy growth rates across societies				
Literacy growth rates within societies				
TEXT 04 Inventions and discoveries				

Trends / events	Trend description	Why positive / good?	Why negative / bad?	Source of information
TEXT 05 Vaccines and disease				
In the United States				
Worldwide				
TEXT 06 Spread of democracy				
Numbers of democracies				
% of democracies				
TEXT 07 Wars and killings				
Wars between types of governments				
Governments killing people				
TEXT 08 CO₂ levels over the last 10,000 years				
Other trends/events				

1

INVESTIGATION LIBRARY

TEXT 01	POPULATION TRENDS	5
TEXT 02	URBAN POPULATION GROWTH	6
TEXT 03	LITERACY AND EDUCATION	7
TEXT 04	INVENTIONS AND DISCOVERIES	8
TEXT 05	VACCINES AND DISEASE	9
TEXT 06	SPREAD OF DEMOCRACY	10
TEXT 07	WARS AND KILLINGS BY GOVERNMENTS	11
TEXT 08	CARBON DIOXIDE LEVELS OVER THE LAST 10,000 YEARS	12

TEXT 01

POPULATION TRENDS

The following table shows global trends over the last 300 years in life expectancy, birth rates, and total population size. It also uses those trends to make future predictions to the year 2100 CE. Ronald Lee, an economics professor at the University of California, created this table. The first column shows life expectancy, or how long on average people will live. The second column shows birth rates, or the average number of births per woman. The last column shows the total size of the population in billions.

Global Population Trends, 1700–2100

	Life Expectancy (Years at Birth)	Total Fertility Rate (Births per Woman)	Population Size (Billions)
1700	27	6.0	.68
1800	27	6.0	.98
1900	30	5.2	1.65
1950	47	5.0	2.52
2000	65	2.7	6.07
2050	74	2.0	8.92
2100	81	2.0	9.46

Source

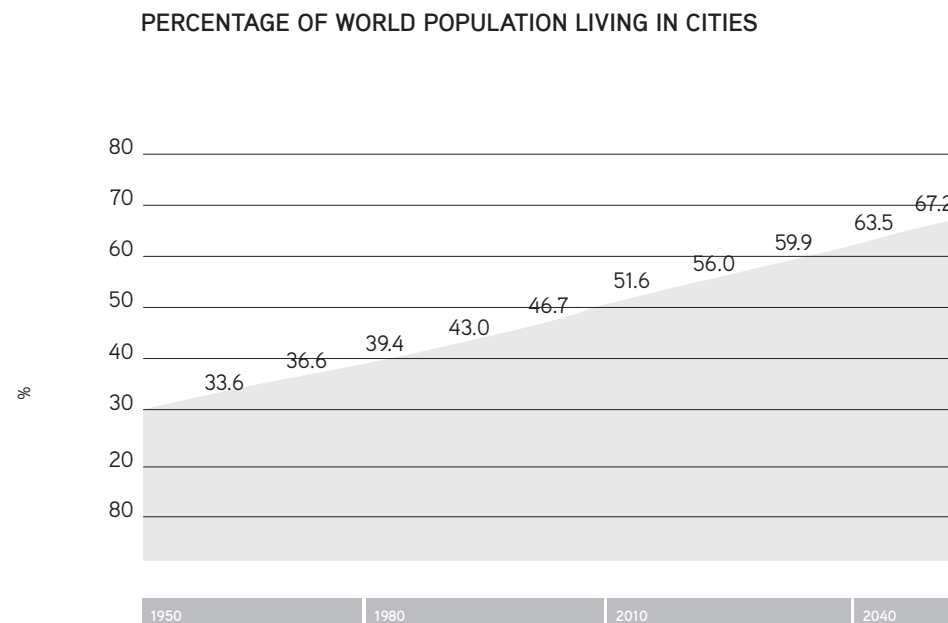
Ronald Lee. "The Demographic Transition: Three Centuries of Fundamental Change," *Journal of Economic Perspectives* 17, no.4 (Fall 2003): 167–90. Note: This table was slightly modified for use by the Big History Project.

TEXT 02

URBAN POPULATION GROWTH

From the dawn of agriculture, our ancestors lived a generally rural lifestyle. Most people did not live in cities or urban areas. For example, only 3 percent of the world's population lived in cities when the Modern Revolution was beginning in 1800. About 200 years later, more than half of the world's population was urban. Experts think that nearly 70 percent of the world population will be urban by 2050.

Also, the number of cities in the world with a population of over 10 million people is growing. According to United Nations publication *World Urbanization Prospects: The 2011 Revision*, only two cities in the world had a population greater than 10 million people in 1970. By 2011, that number had grown to 23.



Source

Graph created using data from *World Urbanization Prospects: The 2011 Revision*, United Nations, Department of Economic and Social Affairs, Population Division, File 2.

TEXT 03

LITERACY AND EDUCATION

In 1850, only 10 percent of the world's population, or about 120 million people, could read and write. Today nearly 80 percent of the world's population, or about 5.1 billion people, are able to do some reading and writing. The *percentage* of people who are not literate, then, has decreased from 90 percent to about 20 percent in the last 160 years.

However, the *actual number* of illiterate people has increased. In 1850, there were about 1.08 billion people who could not read and write. Today there are about 1.28 billion people without literacy skills.

The growth in literacy has not been uniform across or within societies. For example, women are less literate than men: Worldwide – only 88 adult women are considered literate for every 100 adult men.

About 100 million children were not enrolled in primary school in 2002, 55 percent of them girls. The vast majority of the world's adult illiterates live in three regions: South and Southwest Asia, East Asia and the Pacific, and sub-Saharan Africa. However, in recent years literacy rates have increased by more than 10 percent in those areas.

Source

United Nations Educational, Scientific and Cultural Organization (2006). "The Making of Literate Societies." *Education for All Global Monitoring Report: Literacy for Life*. Retrieved from <http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/efareport/reports/2006-literacy/>.

TEXT 04

INVENTIONS AND DISCOVERIES

Below is a listing of major inventions or discoveries made between 1800 and the present.

Year	Inventions	
1800 to 1850	Electric battery (1800) Steam locomotive (1804) Canned food (1810) Spectroscope (1814) Photography (1816) Stethoscope (1819)	Lawn mower (1830) Sewing machine (1830) Electric telegraph (1833) Revolver (1835) Postage stamp (1840) Antiseptics (1847)
1850 to 1899	Elevator (1852) Bicycle (1861) Plastic (1862) Dynamite (1866) Torpedo (1866) Typewriter (1868) Traffic light (1868) Telephone (1876)	Movies (1877) Light bulb (1870) Machine gun (1884) Automobile (1885) Drinking straw (1888) Radio (1895) X-ray (1895) Aspirin (1897) Paper clip (1899)
1900 to 1949	Vacuum cleaner (1901) Airplane (1901) Assembly line (1908) Dixie paper cup (1912) Zipper (1913) Hair dryer (1920) Hearing aid (1923) Television (1923)	Frozen food (1924) Scotch tape (1926) Antibiotics (1928) Helicopter (1936) Guided missile (1942) Atomic bomb (1945) Transistor (1947) Computer (1948)
1950 to now	Credit card (1950) Robot (1954) Solar cell (1954) Video tape recorder (1956) Satellite (1957) Computer modem (1958) Microchip (1958) First human in space (1961)	ATM cash dispenser (1969) Internet (1969) E-mail (1971) Plastic bottles for liquids (1972) Laser printer (1975) Personal computer (1975) In-vitro fertilization (1978) Space telescope (1990)) iPad (2010)

TEXT 05

VACCINES AND DISEASE

Vaccines produce immunity to disease by stimulating the production of antibodies. The first successful vaccine was developed by Edward Jenner in 1796 to help prevent smallpox. Since that time, people have developed many vaccines to fight serious and life-threatening diseases.

Below is a chart created by the National Centers for Disease Control in the United States. It shows the impact of vaccines on six diseases in the United States. The first column shows the disease. The second column, "Pre-vaccine estimated annual Morbidity Rates," provides the estimated yearly number of cases of each disease *before* vaccinations.

Remember that this chart refers only to the United States. According to the World Health Organization, there are still many children in the world not protected by vaccines and modern medicine. In 2012, the WHO claimed that each year, there are about 1.5 million children in the world who die from diseases that could be prevented by vaccines.

Impact of Vaccines on Disease in the United States

Disease	Pre-vaccine estimated annual Morbidity Rates	2010 Reported Cases	% Decrease
Small pox	29,005	0	100%
Diphtheria	21,053	0	100%
Tetanus	580	8	99%
Polio	16,316	0	100%
Measles	530,217	61	>99%
Mumps	162,344	2	

Source

Table was modified from National Centers for Disease Control <http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/G/impact-of-vaccines.pdf>

Information on global vaccination from World Health Organization. (2012). "Global Immunization Data." http://www.who.int/immunization_monitoring/data/en/

TEXT 06

SPREAD OF DEMOCRACY

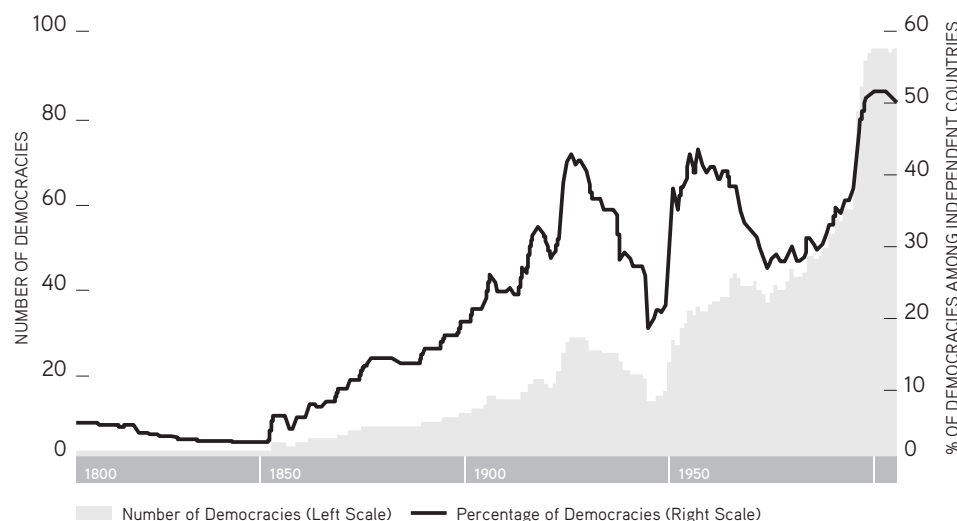
Carles Boix, a professor of politics and public affairs at Princeton University, has studied the growth in the number of democracies over the past 200 years. In the text, below he tells us something of what he has learned.

By 2000 there were around 100 democracies — almost twice the number in 1989 and about three times as many as there were just after World War II (see graph below). More recently,...democracies have kept cropping up at a steady rate.

The majority of mankind may indeed wish to live under free institutions.... But a look at history tells us a more cautionary tale about the chances of democratic progress. The chart below shows that still today, only slightly more than 50 percent of all sovereign states have a democratically constituted government. That proportion is not very different from the share of democracies in the peak years of 1920 and 1955.... Democratic practices appear fragile in the core of the former Soviet Union and in Latin American. And they remain elusive in most of sub-Saharan Africa and in the Middle East.

In the graph below, Dr. Boix shows the number and percentages of democracies in the world by year. The gray area shows the number of democracies while the line shows the percentage of democracies.

NUMBER AND PROPORTION OF DEMOCRACIES IN THE WORLD, 1800–2000



Source

Carles Boix, "The Roots of Democracy," *Policy Review* 135 (February 1, 2006).

TEXT 07

WARS AND KILLINGS BY GOVERNMENTS

The Modern Revolution has provided governments new powers of mass communication and transportation, as well as new powerful weapons. Many governments have used these new powers to control their own populations or to wage war on other societies and peoples.

Below are two charts that describe two of the ways governments and nations have used the powers given them by the Modern Revolution. The first chart shows the number of wars between different types of governments.

The second chart shows the number of people killed by governments. When reading this chart it is important to remember that these are not soldiers killed during war, but civilians.

Wars Involving Democracies and Non-Democracies, 1816–1991

Types of Combatants	Number of Wars
Democracies fighting democracies	0
Democracies fighting non-democracies	155
Non-democracies fighting non-democracies	198
Total Wars, 1816 and 1991	353

Mass Killings Committed by Governments, 1900–1989

Type	Number of People Killed
Own citizens or people	129,547,000
Genocide	38,566,000
Total Murders by Governments, 1900 and 1989	169,202,000

Source

Charts modified from Israel W. Charney (ed.), *Encyclopedia of Genocide* (Santa Barbara, CA: ABC-CLIO, 1999) 24–25. This reference work includes essays from over 100 experts from many different countries on the Nazi Holocaust, the genocides in Armenia, Cambodia, Rwanda, and the former Yugoslavia, as well as on the Soviet prison system and other mass killings in the 20th century.

TEXT 08

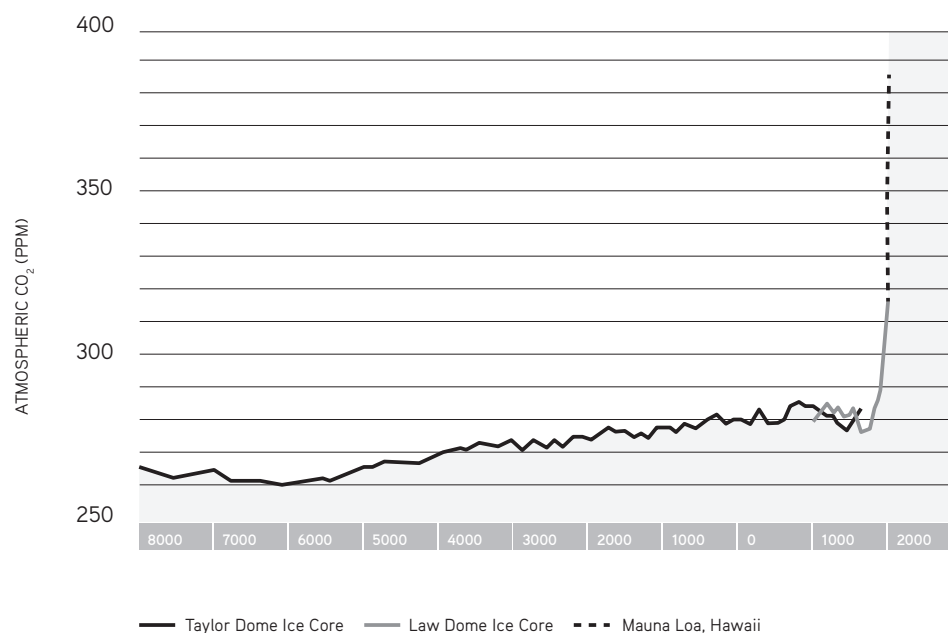
CARBON DIOXIDE LEVELS OVER THE LAST 10,000 YEARS

Carbon dioxide is a chemical compound composed of the elements carbon and oxygen, and whose chemical formula is CO_2 . Carbon dioxide is produced in the Earth's atmosphere in a variety of ways. For example, animals, including humans, breathe in oxygen and exhale carbon dioxide. Burning fossil fuels also releases carbon dioxide into the air.

This chart showing carbon dioxide levels is from *Skeptical Science*, a blog written by John Cook, a scholar working at the Global Change Institute at the University of Queensland, Australia. He takes his information from peer-reviewed scientific journals.

It shows increases in CO_2 levels. CO_2 is the major greenhouse gas thought to cause global warming and climate change. The concentration of CO_2 is increasing from decade to decade. According to a report in the journal *Science*, we would have to go back 15 million years to find levels as high as they are today.

CO_2 LEVELS OVER THE LAST 10,000 YEARS



Sources

John Cook, "Are humans too insignificant to affect global climate?" *Skeptical Science*. 2012. Accessed 5 August 2012.

Aradhna Tripathi et.al., "Coupling of CO_2 and Ice Sheet Stability Over Major Climate Transitions of the Last 20 Million Years," *Science* 326 no. 5958 (4 December 2009): 1394–97.