



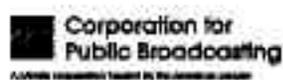
Technology: Conveniences and Consequences

Lesson Plan

Produced by Earth Day Network in association with
American Experience



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INTRODUCTION

In this lesson, students will consider both the benefits and the hazards of technology in today's world through the lens of the environment. Students will realize that, while human inventions have made our lives infinitely more healthy, convenient and enjoyable, they have also introduced new threats, such as toxic pollution, that affect both human health and the health of our environment. The challenge confronting our society – and our students – is identifying the proper use of technology to improve our lives while still protecting the quality of the natural world.

LESSON OVERVIEW

Grade Level & Subject: Grades 8-12: Technology, Science and Social Studies

Length: 2-3 class periods; a portion of Activity Three will be completed as homework

Objectives:

After completing this lesson, students will be able to:

- Consider how technology has both improved our lives and created new threats to environmental and human health.
- Consider how we can maximize the benefits of technology while minimizing the associated harm, largely by applying the “Precautionary Principle” to new technologies.
- Reflect on how modern electronics are changing how we relate to the natural world.

National Standards Addressed:¹

This lesson addresses the following [National Educational Technology Standards](#) from the [International Society for Technology in Education \(ISTE\)](#):

- **Content Standard: NT.K-12.2 SOCIAL, ETHICAL AND HUMAN ISSUES**
 - Students understand the ethical, cultural, and societal issues related to technology.

This lesson addresses the following National Science Education Standards from the [National Academies of Science](#):

- **Content Standard: NS.5-8.6 PERSONAL AND SOCIAL PERSPECTIVES**
 - Personal health
 - Populations, resources, and environments
 - Natural hazards
 - Risks and benefits
 - Science and technology in society
- **Content Standard: NS.9-12.6 PERSONAL AND SOCIAL PERSPECTIVES**
 - Personal and community health
 - Population growth
 - Natural resources

¹ <http://www.educationworld.com/standards/>.

- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national, and global challenges

This lesson addresses the following [National Geography Standards](#) from [The National Geographic Society](#):

- **Content Standard: NSS-G.K-12.4 HUMAN SYSTEMS**
 - As a result of their activities in grades K-12, all students should
 - Understand the characteristics, distribution, and migration of human populations on Earth's surface.
 - Understand the characteristics, distribution, and complexity of Earth's cultural mosaics.
 - Understand the patterns and networks of economic interdependence on Earth's surface.
 - Understand the processes, patterns, and functions of human settlement.
 - Understand how the forces of cooperation and conflict among people influence the division and control of Earth's surface.
- **Content Standard: NSS-G.D-12.5 ENVIRONMENT AND SOCIETY**
 - As a result of their activities in grades K-12, all students should
 - Understand how human actions modify the physical environment.
 - Understand how physical systems affect human systems.
 - Understand the changes that occur in the meaning, use, distribution, and importance of resources.

Materials Needed:

- Reproducible #1 – A Tale of Two Societies Worksheet
- Reproducible #2 – Generation M2: Media in the Lives of 8- to 18-Year-Olds²
- Reproducible #3 – Data Illustrating Trends of Time Spent Outdoors³
- Reproducible #4 – Nature Deficit Disorder Survey⁴

Assessment: Students will be assessed through the following activities:

- Participation in classroom discussions
- Completion of Nature Deficit Disorder survey as homework
- Completion of visual(s) illustrating benefits and consequences of modern technology

LESSON BACKGROUND

Relevant Vocabulary:

² "Report: Generation M2: Media in the Lives of 8- to 18-Year-Olds" (#8010), The Henry J. Kaiser Family Foundation, January 2010.

³ Pergams, Oliver R.W. and Zaradic, Patricia A. "Evidence for a Fundamental and Pervasive Shift Away From Nature-Based Recreation." *The National Academy of Sciences of the USA*, 2008.
<http://www.pnas.org/content/105/7/2295.full.pdf+html>.

⁴ "Nature Deficit Disorder Survey," National Environmental Education Week, a program of the National Environmental Education Foundation. Retrieved 20 January 2010 from <http://www.eeweek.org/resources/survey.htm>.

- **Nature Deficit Disorder:** A condition that some people maintain is a spreading affliction especially affecting youth but also their adult counterparts, characterized by an excessive lack of familiarity with the outdoors and the natural world.⁵
- **Precautionary Principle:** The approach whereby any possible risk associated with the introduction of a new technology is largely avoided, until a full understanding of its impact on health, environment and other areas is available.⁶

Information:

“There is something much more insidious with things that are not so visible and nevertheless have dramatic impacts. Like nuclear fallout from atmospheric nuclear tests. When I was born, Strontium-90 didn’t exist. By the time I was a teenager every living creature on the planet had Strontium-90 in its bones or its shells. That is a fairly profound change.” – Denis Hayes, coordinator of the original Earth Day⁷ (film chapter: Consequences of Development)

Today, technology saturates our lives. Throughout human history, many creative people have made possible an incredible array of technological advances – from chemicals and medicines, to machines and tools that make our lives more interesting, convenient, and healthy. Think of how immensely different our lives are today compared with our earliest ancestors. Consider their scientific knowledge, medical care, household conveniences, modes of transportation, sources of energy, forms of entertainment, and methods of growing, harvesting, storing, processing, and distributing food. Not many of us would want to live the way our ancestors did 2000, 200, or even 2 years ago.

At the same time, our ancestors did not have to worry about many of the vast problems that concern us today. Yes, technology has given us the ability to live longer, healthier, easier, and more enjoyable lives, but it has also created new perils that our ancestors could hardly fathom. For instance, many thousands of chemicals created by humans are circulating in our world today that did not exist in ancient times. Today, they are practically inescapable in our air, water, soil, and bodies. Many of them are known to cause harm to, or even kill, living organisms including humans. Many others are suspected of insidiously threatening us and the environment over the long-term, often in ways still largely unknown to scientists and the general public.

Technology has also managed to harness enormous amounts of energy to power our lifestyles, providing us with transportation, heating, and power. But this energy comes at a great cost, producing such calamities as: oil spills, landscapes devastated by resource extraction, foul-smelling smog in our cities, or free-flowing rivers clogged by dams. In learning how to capture the formidable energy inside the atomic nucleus, we have also created great quantities of dangerous nuclear waste that we still have no proper form of disposal. This same technology has the means – for the first time in human history – of destroying our species and the planet itself. Our ancestors never had to worry about such perils.

Now, it is clear that our thirst for energy is even changing the climate of the planet. Specifically, the burning of fossil fuels (coal, oil and natural gas) is raising the Earth’s global temperature and creating

⁵ Louv, Richard. *Last Child in the Woods*. Chapel Hill: Algonquin Books of Chapel Hill, 2005, page 32.

⁶ Cameron, James and O’Riordan, Timothy, eds. *Interpreting the Precautionary Principle*. London: Earthscan Publications Ltd., 1994.

⁷ *Earth Days*. Dir. Robert Stone. PBS/American Experience.

a host of associated problems, ranging from prolonged droughts in the Southwestern United States to melting glaciers in the Arctic and Antarctic and rising sea levels worldwide.

In recent years, we have begun to suspect that we are confronting yet another new technological risk, namely the impact that electronics are having on our lives. Some have become concerned that the huge amounts of time people (especially children) are spending in front of computer, television, video, and phone screens are having unintended consequences: the removal of people from nature and the natural world, the reduction of time youth spend interacting with each other and engaging in free play, and even the physical alteration of our brains.⁸ We are, in effect, carrying out a gigantic, inadvertent experiment on ourselves. It remains to be seen what the full effect of modern electronics will be on our society, environment, and physical and mental health.⁹

Before the first Earth Day, many people had complete confidence in the unalloyed benefits of modern technology. They were dazzled by the prospect of technology solving all our problems and creating a world of increasing ease, convenience, and prosperity. And so, we created a dizzying array of chemicals and other inventions while, for the most part, thinking little of the impact these new creations might have on our environment and on ourselves. Then, in 1962, Rachel Carson, in dramatic fashion, shocked the world with her account of the impact that indiscriminate pesticide use was having on our environment. Collectively, people began to perceive air and water becoming dirtier, forests and wildlife disappearing, and diseases, such as various cancers, becoming increasingly frequent. We began to realize that technology, recklessly applied, could create new problems and exacerbate others, many of them potentially avoidable.

“There were certainly people who had their pet causes. Some pounded vehicles apart with sledgehammers as a protest against the internal combustion engine. Others wore gas masks to protest air pollution, but also there was an almost celebratory thing where it was as though we were awakening to a new set of opportunities.” – Denis Hayes, coordinator of the original Earth Day.¹⁰ (film chapter: The First Earth Day)

In many ways, the first Earth Day was a response to this growing alarm surrounding technology’s impact on our planet. Since that day in 1970, we have made great strides in appreciating the fragility and importance of our environment and in working for its protection. And, while we know that technological carelessness has caused many serious environmental problems, we also realize that innovation can also play a significant role in resolving them. It is all the more important that people study this issue for a better understanding in order to not repeat previous mistakes.

The following exercises are designed to help students reflect on both the benefits and the consequences of technology, and how we can attain more of the former and fewer of the latter.

Resources:

- National Environmental Education Foundation: <http://www.neefusa.org/>.

⁸ Louv, Richard. *Last Child in the Woods*. Chapel Hill: Algonquin Books of Chapel Hill, 2005, page 85- 111.

⁹ "Report: Generation M2: Media in the Lives of 8- to 18-Year-Olds" (#8010), The Henry J. Kaiser Family Foundation, January 2010.

¹⁰ *Earth Days*. Dir. Robert Stone. PBS/American Experience, 2010.

- "Report: Generation M2: Media in the Lives of 8- to 18-Year-Olds" (#8010), The Henry J. Kaiser Family Foundation, January 2010 (<http://www.kff.org/entmedia/8010.cfm>).

LESSON STEPS

Warm Up: *Discussion – What Is Technology?*

1. Begin by asking students what they think technology is.
2. After discussing the meaning of technology, present and discuss the following definitions. The *American Heritage Dictionary* actually has three separate meanings for the word:
 - A. The application of science, especially to industrial or commercial objectives; the scientific method and material used to achieve a commercial or industrial objective.
 - B. Electronic or digital products and systems considered as a group (ex. a store specializing in office technology.)
 - C. (*Anthropology*) The body of knowledge available to a society that is of use in fashioning implements, practicing manual arts and skills, and extracting or collecting materials.¹¹

Discuss with students what they think of the above definitions. Do they think any are outdated? Would they add any definitions of their own? *Students might be most familiar with definition B, as they probably use the term in the context of electronics and their increasing prominence in so many lives. Yet, definition A shows that technology refers to much more than electronics; it encompasses the machinery, chemicals, and other inventions that humans have created to make and shape our current world.*

Activity One: *Technology in the Classroom*

Students develop their understanding of the role technology plays in their lives by considering how it is commonly used in the classroom.

1. Once your class has settled on the meaning of the word, have students examine the classroom to find examples of technology. Have them consider both electronics and also the products that were manufactured through applied science (also technology). List their discoveries on the board. Challenge students to think beyond their most immediate examples of technology. *Technology actually has been used in the manufacture of virtually everything in the room.*
2. Ask students if they know how these classroom examples were manufactured. Might their production have emitted pollution in the air, water, or soil (e.g. through smokestacks, transportation exhaust, or pipes dumping waste in waterways)? Does anyone know the environmental impact caused by the manufacture of the items in the room? How aware are most people about the environmental impact of common objects and behaviors?

¹¹ "Technology." *The American Heritage Dictionary*. 4th ed. 1981.

3. Technology is also applied in the generation and distribution of energy. Ask your students to identify all of the features in the room that require, or that have required, the use of energy. *Answers will include, of course, the lights, computers, and other appliances being powered by electricity, along with any cell phones and other electronics. In addition, energy was used in the manufacture of basically everything in the room.* Do your students know how the room's electricity is being generated?

4. Follow up with a discussion about energy. How is energy generated in the United States? *Examples will include the power generated from hydroelectric, wind, solar, geothermal and nuclear sources and from the burning of coal, petroleum and natural gas.* What do your students know about the environmental impact of utilizing these energy sources? *Typically, renewable energy sources, such as solar and wind, have a substantially smaller environmental impact compared to non-renewable energy sources, such as fossil fuels (coal, oil and natural gas).*

Activity Two: *The Promise and Perils of Technology*

Students should consider differences in societies and compare both the technological advancements and the environmental quality of both.

1. Have students consider two types of societies. Society A is similar to what we envision long ago or in various parts of the world today – it uses simpler forms of technology and lacks many of the large-scale systems in place today, such as sanitation systems or the internet. In Society A, if a citizen wants a drink of water, s/he must walk to the closest freshwater source to fill their container with enough water to last until the next time s/he is able to walk the distance. This is a society where people do not have the same conveniences many people have today. They live closely with nature and have simpler tools. Society B is quite different from the first, and more similar to the students' own lives – full of the many technological inventions and modern conveniences. If a citizen of this society desires a drink of water, s/he walks over to the faucet, turns it on, and clean water immediately flows out. Ask students to use their imagination or prior knowledge to fill out Reproducible #1 – A Tale of Two Societies Worksheet, considering the technology available to each person. They will compare the following:
 - Heating the living quarters
 - Making tools for hunting, procuring food, and sewing clothing
 - Obtaining clean drinking water
 - Getting rid of wastes and garbage
 - Diagnosing and curing illness
 - Transporting people and goods

2. Now, ask students to compare the peoples' connections with the environment in Society A compared with Society B. Would either group know more about:
 - Where drinking water would come from?
 - Where food would come from?
 - What would happen to wastes?
 - What would be required to make tools?

- Where cures for illness would come from?

Most of human history was based around a society that functioned more like Society A. Previous to industrialization, all humans were directly involved with collecting water, making tools, transporting goods, etc. They would know where their water and food came from because they would have gathered such resources themselves. They would have disposed of their own wastes, made their own tools, and found the medicinal plants needed to cure afflictions. In contrast, many of us live somewhere akin to Society B, mostly removed from these activities. We don't see where our food is grown and processed, we watch our trash disappear on trucks, our sewage disappear down the toilet, and we buy tools and medicines that were made somewhere else. The upshot is that most of us have a greater amount of free time and efficiency in our lives.

3. What would be various pros and cons to living in each of these societies? *Answers will vary but may include the following. Inhabitants of Society A spend much of their day taking care of individual needs and daily tasks. They have less leisure time or time for additional activities. Yet, they have the benefit of intimate knowledge about the natural world around them and are more likely to get fresh air and exercise. Inhabitants of Society B have many daily tasks organized or taken care of through increased efficiency and advanced technology, leaving them more time to invest in other activities. They have more conveniences, comforts, and shelter, yet they lack intimate knowledge about their natural world.*
4. The class can wrap up the activity by considering the following questions in a class discussion:
 - How do Societies A and B relate to human experiences past and present? Think about the experiences of prehistoric people versus modern humans. *Society B may be most familiar to many of us today and Society A is more representative of much of human history before the last few centuries. Many areas of the world today fall somewhere in between these two examples, but it is difficult to find a society living completely in isolation of modern technology and its effects.*
 - How clean was the prehistoric environment compared with the world today? What chemicals were in the air, water, and soil during prehistoric times? What chemicals were in the prehistoric people themselves? Did prehistoric people have to worry about toxic chemicals? Were they concerned with nuclear waste? Was there any significant pollution at all? *Answers will vary, but there were many fewer chemicals, waste and pollution in prehistoric times.*
 - Do you think that modern humans' distance from the environment makes us less aware of how we affect the environment and how, in turn, the environment provides for our needs and desires? Does this disconnect hinder our ability to fully appreciate our impact on the environment and understand why it is essential to treat it wisely? *Our isolation from the natural world that sustains us likely presents a formidable obstacle toward fully appreciating the environment's importance in our lives.*
 - In order to reap the multiple benefits that technology affords us, is it really necessary to harm our environment in the process? How much of the environmental damage that we create is simply the result of ignorance, thoughtlessness, or recklessness? How much damage could be prevented with applied forethought? *Answers will vary.*
 - Introduce the idea of the "Precautionary Principle" and how it can lead to a broader consideration for our society's health and the environment. *The Precautionary Principle states that if we consider the possible ramifications of our new inventions and take steps to reduce or*

even eliminate these consequences BEFORE we put our creations into wide use, we can significantly cut back or eliminate the negative effects of new technologies.

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Activity Three: *The Impact of Electronics – Are We Turning Away from Nature?*

Students will consider the impact that electronics are having on their lives and whether they are causing youth and also adults to become disconnected with the natural world. Students will examine this trend and consider possible consequences for people and the environment.

1. Ask students to read the article “If Your Kids Are Awake, They’re Probably Online” from the *New York Times* (<http://www.nytimes.com/2010/01/20/education/20wired.html>)¹² and/or the study in Reproducible # 2 - Generation M2: Media in the Lives of 8- to 18-Year-Olds.¹³ Have them consider the amount of technology they use compared to the kids in the article and/or study.
2. Next, have your students consult the table on Reproducible #3 – Data Illustrating Trends of Time Spent Outdoors. Ask students to compare and contrast data. Has the number of National Park Visits decreased or increased over the last century? *Decreased. Why? Answers will vary, but the trend may have a correlation with increased urbanization and technological advancement over the given time period.* What about the number of people hunting and fishing? *Decreased. Why? Answers will vary, but the trend may also have a correlation with increased urbanization and technological advancement over the given time period.* Is there any difference between Japan and the U.S. according to the data? *Not much.* Why do you think these two countries were chosen? *They are geographical separate and distinct, but have had similar trends of technological advancement over the last century.*
3. Pass out copies of Reproducible #4 – Nature Deficit Disorder Survey Sheet (you may want to give each student more than one to conduct additional interviews). Ask your students to use the form to survey their parents or other adults as homework. This survey asks adults to compare the childhoods they remember with those of your students. Have your students record their results and answer the questions following their surveys.

Wrap Up: *Examining Nature Deficit Disorder*

1. Share and tally students’ results and answers as a class. Discuss their findings and thoughts.
2. Wrapping up, ask students if they think they have Nature Deficit Disorder (NDD). Is it really a disorder? What role does technology play in this issue? Is this a problem that needs to be addressed? Is it just a clever-sounding gimmick? If it does present a problem, what should we do about it? *Answers will vary.*
3. Now that students have surveyed their parents or adults on their childhood experiences with nature, relate their findings in a discussion about the data in the last activity regarding the decline in outdoor recreation activity over the last century.
4. Relate students’ survey results, observations and ideas about NDD with earlier discussions about technology. Of technology’s many impacts on human lives and the environment, both

¹² “If Your Kids are Awake, They’re Probably Online,” *The New York Times*, January 20, 2010.

¹³ "Report: Generation M2: Media in the Lives of 8- to 18-Year-Olds" (#8010), The Henry J. Kaiser Family Foundation, January 2010.

good and bad, what do they think is the most substantial? What are the tradeoffs? Does one outweigh the other? *Answers will vary.*

5. Students should follow up these discussions by producing a visual representation (collages, cartoons, charts or other visuals) illustrating both the benefits and the consequences of modern technology. Have them consider what various technologies do for us, as well as their consequences on the environment (and ultimately on us). Students should share completed work with the class.

Extensions:

1. If time allows, students can read or consult Rachel Carson's *Silent Spring*¹⁴ and perceive a dramatic example of technology applied in the absence of the Precautionary Principle. *Silent Spring* describes the great damage that occurred when people applied vast amounts of insecticides and other chemicals to kill insect-related pests without considering the impact these poisons would have on environmental and human health. Carson concludes her sobering account, among the most important and influential scientific books ever written, with alternative ways of controlling insect-related pests, methods that people could have easily applied instead of poisons.
2. Technology can be an important solution in helping humans reduce our impact on the environment and use resources more wisely and efficiently. Have students brainstorm, discuss, illustrate or present on ideas of technology (already in existence or not) that might be solutions to many of the environmental problems we face today (for example, clean energy technology, innovations in efficiency, improved methods of transportation, etc.). Encourage creativity! Make sure students weigh the benefits of these inventions against their consequences of production, transport, energy use and output.

CONCLUSION

The lesson helped students consider the impact, both positive and negative, that technology is having on the environment, as well as their lives, and why it is important to carefully consider the potential known and unknown consequences of new technologies.

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¹⁴Carson, Rachel. *Silent Spring*. Cambridge, MA: Houghton Mifflin Company, 1962.

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A Tale of Two Societies

Name:

Date:

Activity	Society A	Society B
Heat the living quarters:		
Make tools for hunting, procure food and create clothing:		
Obtain drinking water:	Walk to the closest freshwater source, fill container with enough water to last until next time, and carry it home.	Turn on the faucet.
Get rid of wastes and garbage:		
Diagnose and cure illness:		
Transport people and goods:		
Explain natural phenomena:		

Key Findings

Over the past five years, there has been a huge increase in media use among young people.

Five years ago, we reported that young people spent an average of nearly 6½ hours (6:21) a day with media—and managed to pack more than 8½ hours (8:33) worth of media content into that time by multitasking. At that point it seemed that young people’s lives were filled to the bursting point with media.

Today, however, those levels of use have been shattered.

Over the past five years, young people have increased the amount of time they spend consuming media by an hour and seventeen minutes daily, from 6:21 to 7:38—almost the amount of time most adults spend at work each day, except that young people use media seven days a week instead of five.

Moreover, given the amount of time they spend using more than one medium at a time, today’s youth pack a total of 10 hours and 45 minutes worth of media content into those daily 7½ hours—an increase of almost 2¼ hours of media exposure per day over the past five years.

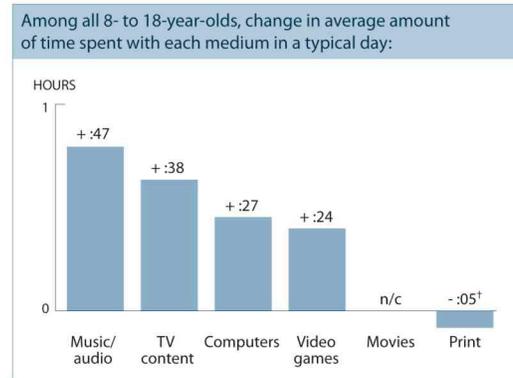
Media Use Over Time

Among all 8- to 18-year-olds, average amount of time spent with each medium in a typical day:			
	2009	2004	1999
TV content	4:29 ^a	3:51 ^b	3:47 ^b
Music/audio	2:31 ^a	1:44 ^b	1:48 ^b
Computer	1:29 ^a	1:02 ^b	:27 ^c
Video games	1:13 ^a	:49 ^b	:26 ^c
Print	:38 ^a	:43 ^{ab}	:43 ^b
Movies	:25 ^a	:25 ^{ab}	:18 ^b
TOTAL MEDIA EXPOSURE	10:45 ^a	8:33 ^b	7:29 ^c
Multitasking proportion	29% ^a	26% ^a	16% ^b
TOTAL MEDIA USE	7:38 ^a	6:21 ^b	6:19 ^b

Notes: See Methodology section for a definition of terms, explanation of notations, and discussion of statistical significance. See Appendix B for a summary of key changes in question wording and structure over time. **Total media exposure** is the sum of time spent with all media. **Multitasking proportion** is the proportion of media time that is spent using more than one medium concurrently. **Total media use** is the actual number of hours out of the day that are spent using media, taking multitasking into account. See Methodology section for a more detailed discussion. In this table, statistical significance should be read across rows.

Use of every type of media has increased over the past 10 years, with the exception of reading. In just the past five years, the increases range from 24 minutes a day for video games, to 27 minutes a day for computers, 38 minutes for TV content, and 47 minutes a day for music and other audio. During this same period, time spent reading went from 43 to 38 minutes a day, not a statistically significant change. But breaking out different types of print does uncover some statistically significant trends. For example, time spent reading magazines dropped from 14 to nine minutes a day over the past five years, and time spent reading newspapers went down from six minutes a day to three; but time spent reading books remained steady, and actually increased slightly over the past 10 years (from 21 to 25 minutes a day).

Changes in Media Use, 2004–2009



[†] Not statistically significant. See Appendix B for a summary of key changes in question wording and structure over time.

An explosion in mobile and online media has fueled the increase in media use among young people.

The story of media in young people’s lives today is primarily a story of technology facilitating increased consumption. The mobile and online media revolutions have arrived in the lives—and the pockets—of American youth. Try waking a teenager in the morning, and the odds are good that you’ll find a cell phone tucked under their pillow—the last thing they touch before falling asleep and the first thing they reach for upon waking. Television content they once consumed only by sitting in front of a TV set at an appointed hour is now available whenever and wherever they want, not only on TV sets in their bedrooms, but also on their laptops, cell phones and iPods®.

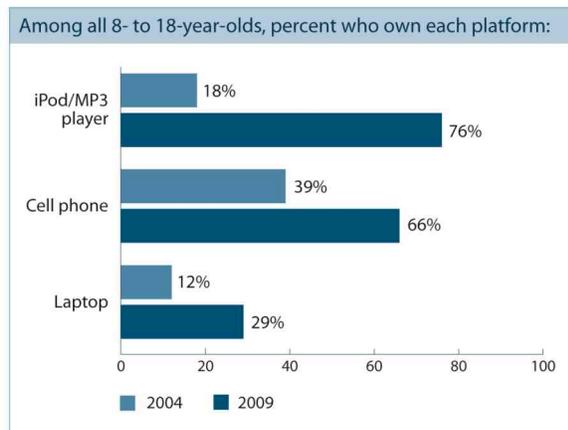
¹⁵ "Report: Generation M2: Media in the Lives of 8- to 18-Year-Olds" (#8010), The Henry J. Kaiser Family Foundation, January 2010.

Today, 20% of media consumption (2:07) occurs on mobile devices—cell phones, iPods or handheld video game players. Moreover, almost another hour (:56) consists of “old” content—TV or music—delivered through “new” pathways on a computer (such as Hulu™ or iTunes®).

Mobile media. The transformation of the cell phone into a media content delivery platform, and the widespread adoption of the iPod and other MP3 devices, have facilitated an explosion in media consumption among American youth. In previous years, the proliferation of media multitasking allowed young people to pack more media into the same number of hours a day, by reading a magazine or surfing the Internet while watching TV or listening to music. Today, the development of mobile media has allowed—indeed, encouraged—young people to find even more opportunities throughout the day for using media, actually expanding the number of hours when they can consume media, often while on the go.

Over the past five years, the proportion of 8- to 18-year-olds who own their own cell phone has grown from about four in ten (39%) to about two-thirds (66%). The proportion with iPods or other MP3 players increased even more dramatically, jumping from 18% to 76% among all 8- to 18-year-olds.

Mobile Media Ownership, Over Time



Not only do more young people own a cell phone, but cells have morphed from a way to hold a conversation with someone into a way to consume more media. Eight- to eighteen-year-olds today spend an average of a half-hour a day (:33) talking on their cell phones, and an average of 49 minutes a day (:49) listening to, playing or watching other media on their phones (:17 with music, :17 playing games, and :15 watching TV)—not to mention the hour and a half a day that 7th- to 12th-graders spend text-messaging (time spent texting is *not* included in our count of media use, nor is time spent talking on a cell phone).

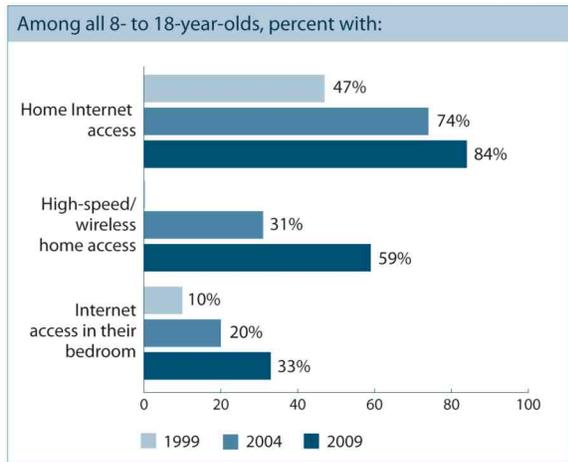
These two platforms—cell phones and MP3 players—account for a sizeable portion of young people’s increased media consumption. For example, total time spent playing video games increased by about 24 minutes over the past five years (from :49 to 1:13), and 20 minutes of that increase comes on cell phones, iPods and handheld video game players. Time spent listening to music and other audio has increased by more than three-quarters of an hour a day (:47) to just over 2½ hours (2:31); nearly an hour (:58) of that listening occurs via a cell phone or an iPod, and another 38 minutes is streamed through the computer, through programs like iTunes or Internet radio.

Television on new media platforms. For the first time since we began this research in 1999, the amount of time young people spend watching regularly scheduled programming on a television set at the time it is originally broadcast has declined (by :25 a day, from 3:04 to 2:39). However, the proliferation of new ways to consume TV content has actually led to an *increase* of 38 minutes of daily TV consumption. The increase includes an average of 24 minutes a day watching TV or movies on the Internet, and about 15 minutes each watching on cell phones (:15) and iPods (:16). Thus, even in this new media world, television viewing—in one form or another—continues to dominate media consumption, taking up about 4½ hours a day in young people’s lives (up from a total of 3:51 in 2004). But *how* young people watch TV has clearly started to change. Indeed, today just 59% of young people’s TV watching occurs on a TV set at the time the programming is originally broadcast; fully 41% is either time-shifted, or occurs on a platform other than a TV set.

Online media. In addition to mobile media, online media have begun making significant inroads in young people’s lives. The continued expansion of high-speed home Internet access, the proliferation of television content available online, and the development of compelling new applications such as social networking and YouTube, have all contributed to the increase in the amount of media young people consume each day. Today’s 8- to 18-year-olds spend an average of an hour and a half (1:29) daily using the computer outside of school work, an increase of almost half an hour over five years ago (when it was 1:02).

In the last five years, home Internet access has expanded from 74% to 84% among young people; the proportion with a laptop has grown from 12% to 29%; and Internet access in the bedroom has jumped from 20% to 33%. The quality of Internet access has improved as well, with high-speed access increasing from 31% to 59%.

Home Internet Access, Over Time



New online capabilities and types of content have also come to play an important role in young people’s media activities. Two of the three most popular computer destinations among this age group—social networking and video sites like YouTube—were not widely available five years ago; today they account for an average of :37 of young people’s daily media time (:22 for social networking and :15 for video websites).

Youth who spend more time with media report lower grades and lower levels of personal contentment.

For purposes of comparison, young people were grouped into categories of heavy, moderate and light media users. Heavy users are those who consume more than 16 hours of media content in a typical day (21% of all 8- to 18-year-olds); moderate users are those who consume from 3–16 hours of content (63%); light users are those who consume less than three hours of media in a typical day (17%).

Nearly half (47%) of all heavy media users say they usually get fair or poor grades (mostly C’s or lower), compared to 23% of light media users. Heavy media users are also more likely to say they get into trouble a lot, are often sad or unhappy, and are often bored. Moreover, the relationships between media exposure and grades, and between media exposure and personal contentment, withstood controls for other possibly relevant factors such as age, gender, race, parent education, and single vs. two-parent households.

This study cannot establish whether there is a cause and effect relationship between media use and grades, or between media use and personal contentment. And if there are such relationships, they could well run in both directions simultaneously.

Media, Grades and Personal Contentment

	Heavy Users	Moderate Users	Light Users
Good grades (A’s and B’s)	51% ^a	65% ^b	66% ^b
Fair/poor grades (C’s or below)	47% ^a	31% ^b	23% ^c

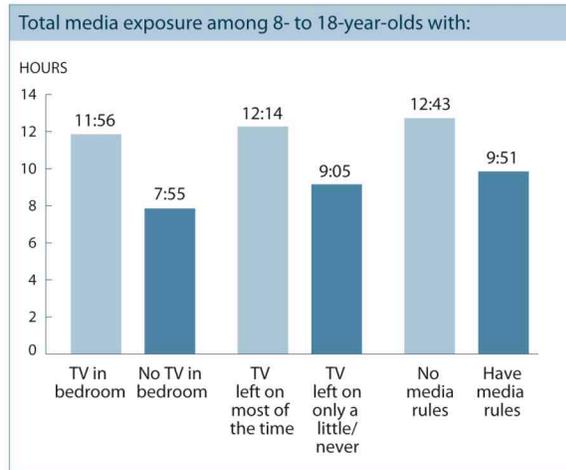
Have a lot of friends	93%	91%	91%
Get along well with their parents	84% ^a	90% ^b	90% ^{ab}
Have been happy at school this year	72% ^a	81% ^b	82% ^b
Are often bored	60% ^a	53% ^b	48% ^b
Get into trouble a lot	33% ^a	21% ^b	16% ^b
Are often sad or unhappy	32% ^a	23% ^b	22% ^b

Note: Statistical significance should be read across rows.
[†] Students whose schools don’t use grades are not shown.
^{††} Percent who say each statement is “a lot” or “somewhat” like them.

Children whose parents make an effort to limit media use—through the media environment they create in the home and the rules they set—spend less time with media than their peers.

Children who live in homes that limit media opportunities spend less time with media. For example, kids whose parents *don’t* put a TV in their bedroom, *don’t* leave the TV on during meals or in the background when no one is watching, or *do* impose some type of media-related rules spend substantially less time with media than do children with more media-lenient parents.

Media Exposure, by TV Environment and Rules



Data Illustrating Trends of Time Spent Outdoors

Variable	Peak Year	Last Year of Data	% Decline Since Peak	% Annual Decline	Data Points (N)
Ducks	1953	2006	66	1.2	72
Fishing	1981	2005	25	1.0	53
NPV	1987	2006	23	1.2	68
Japan NPV	1991	2005	18	1.3	56
AT Hiking*	2000	2005	18	3.6	71

*Key:

Ducks = Number of Duck Stamps Issued

Fishing = Number of Fishing Licenses Issued

NPV = Number of National Park Visits in U.S.

Japan NPV = Number of National Park Visits in Japan

AT Hiking = Number of hikers completing all 3,500 km of the Appalachian Trail

Data from this table is from: Pergams, Oliver R.W. and Zaradic, Patricia A. "Evidence for a Fundamental and Pervasive Shift Away From Nature-Based Recreation." *The National Academy of Sciences of the USA*, 2008.

<http://www.pnas.org/content/105/7/2295.full.pdf+html>. Used with permission.

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Nature Deficit Disorder Survey¹⁶

Name: _____

Please take time to interview your parent(s)/guardian(s) using the questions in the table below as a guide. If you can talk to more than one adult, it would be helpful.

Ask your parent(s)/guardian(s) if they (the adults) spent more time, less time, or about the same amount of time as you doing the following activities as a child:

What grade are you in? _____

Amount of time spent indoors:

Much More _____ More Time _____ Same Amount _____ Less Time _____ Much Less _____
Time of Time Time

Amount of time spent outdoors:

Much More _____ More Time _____ Same Amount _____ Less Time _____ Much Less _____
Time of Time Time

Time spent in adult-sanctioned activities (e.g. classes, scouts) and sports (e.g. Little League, soccer league):

Much More _____ More Time _____ Same Amount _____ Less Time _____ Much Less _____
Time of Time Time

Time spent inventing outdoor games, making forts, etc.:

Much More _____ More Time _____ Same Amount _____ Less Time _____ Much Less _____
Time of Time Time

Time spent being chauffeured in a car:

Much More _____ More Time _____ Same Amount _____ Less Time _____ Much Less _____
Time of Time Time

Time spent observing nature (walking in the woods, going to nature preserves, hiking, etc.):

Much More _____ More Time _____ Same Amount _____ Less Time _____ Much Less _____
Time of Time Time

¹⁶ "Nature Deficit Disorder Survey," National Environmental Education Week, a program of the National Environmental Education Foundation. Retrieved 20 January 2010 from <http://www.eeweek.org/resources/survey.htm>. Used with permission.

If the adults you interviewed spent more time in free play and time outdoors than you, ask whether they valued these things and why. Summarize here:

Nature Deficit Disorder is a condition that some people maintain is a spreading affliction especially affecting youth but also their adult counterparts, characterized by an excessive lack of familiarity with the outdoors and the natural world. Would you describe yourself as a person who experiences Nature Deficit Disorder? Why or why not? Explain:

Do you feel that most of your peers experience Nature Deficit Disorder or not? Why or why not? Explain:

Do you think that Nature Deficit Disorder is something we should be concerned with? Why or why not?

Appendix¹⁷

Excerpt from “Consequences of Development”

Denis Hayes, The Organizer	I mean, this was just progress. There is something much more insidious with things that are not so visible and nevertheless have dramatic impacts. Like nuclear fallout from atmospheric nuclear tests. When I was born, Strontium-90 didn't exist. By the time I was a teenager every living creature on the planet had Strontium-90 in its bones or its shells. That is a fairly profound change and we'd done it.
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Excerpt from “The First Earth Day”

Denis Hayes, The Organizer	There were certainly people who had their pet causes. Some pounded vehicles apart with sledgehammers as a protest against the internal combustion engine. Others wore gas masks to protest air pollution, but also there was an almost celebratory thing where it was as though we were being awakening to a new set of opportunities.
Denis Hayes (archival)	They are talking about emissions control on automobiles, while we are talking about bans on automobiles. We are challenging the ethics of a society that with only 6% of the world's population accounts for more than half of its utilization of resources. Our country is stealing from the poorer countries of the world and from generations as yet unborn.

¹⁷ Earth Days. Dir. Robert Stone. PBS/ American Experience, 2010.