

Digital Initiatives in STEM Education

Learning with technology is a 200,000-year-old tradition

If you think the "information technology" transformation in schools and workplaces is new to the 21st century, you might want to look back thousands of years. Using technology to learn, play, and develop skills is a continuation of our quest to survive and adapt. About 77,000 years ago, we used baboon bone and ochre plaques. Today, we use tablets, smartphones, and video games.



200,000 Years Ago ⚙️ Now

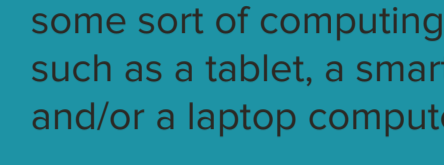
During dramatic climate changes, human ability to craft tools and teach offspring is fundamental to survival.

Children learn to survive and contribute to society by playing with bows and arrows.

During rapid information technology changes, humans increasingly rely on digital technology to thrive.

Children learn to survive and contribute to society by playing with information.

4 out of 5



In a nationwide sample of nearly 2,400 families, more than four in five K-12 students occasionally use some sort of computing device such as a tablet, a smartphone, and/or a laptop computer.

164,000 Years Ago 👛 Now

Modern humans collect and cook shellfish to make a living.

Modern humans collect and analyze data to make a living.

19th Century:

New jobs in the Industrial Revolution require the ability to read and write.

21st Century:

26 million U.S. jobs (20% of all U.S. jobs) require a high level of knowledge in any one STEM (Science, Technology, Engineering, Math) field.

STEM jobs have doubled as a proportion of all jobs since the Industrial Revolution.



15.68 M

Americans are projected to be employed in STEM fields by 2018.

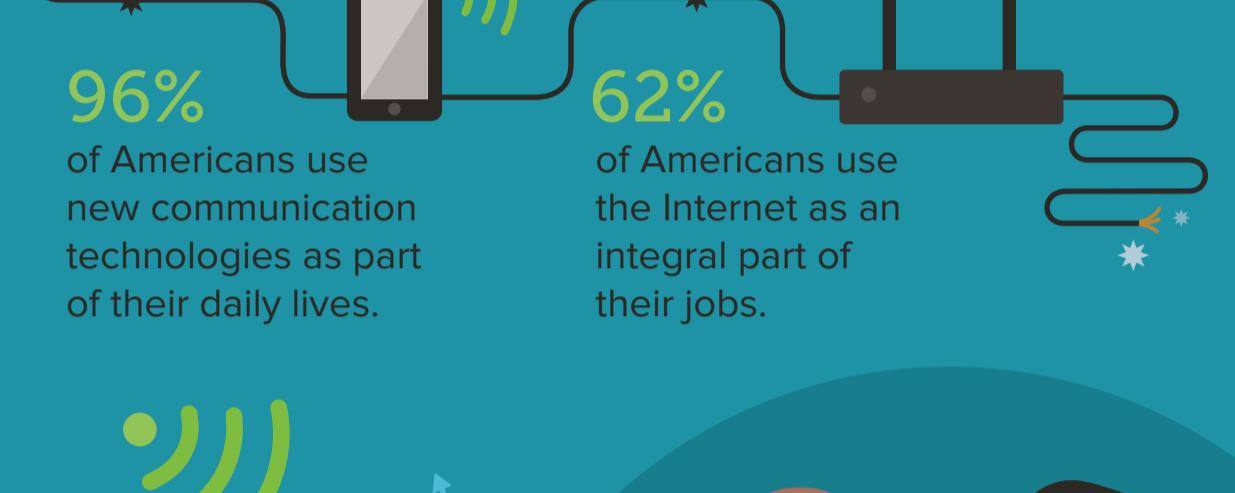
71%

of STEM jobs by 2018 are projected to be in computing.

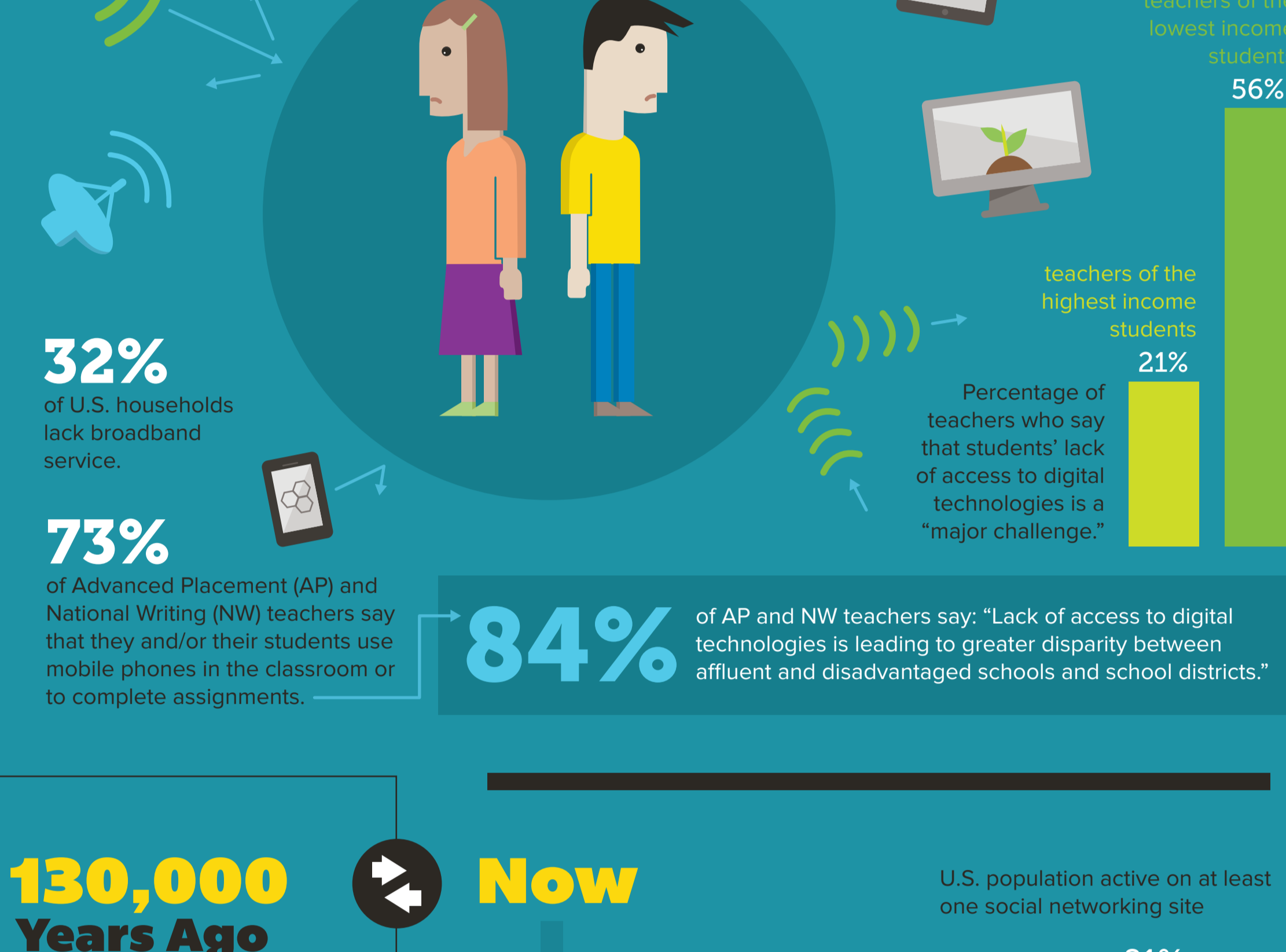
\$10 trillion annually

is the estimated total of global online transactions. The human economy is web-based.

Digital literacy and STEM education go hand-in-hand...



but not in everyone's hands:



130,000 Years Ago ↔️ Now

Modern humans form person-to-person social networks, exchanging resources over long distances.

Modern humans form digital social networks, exchanging information over long distances.

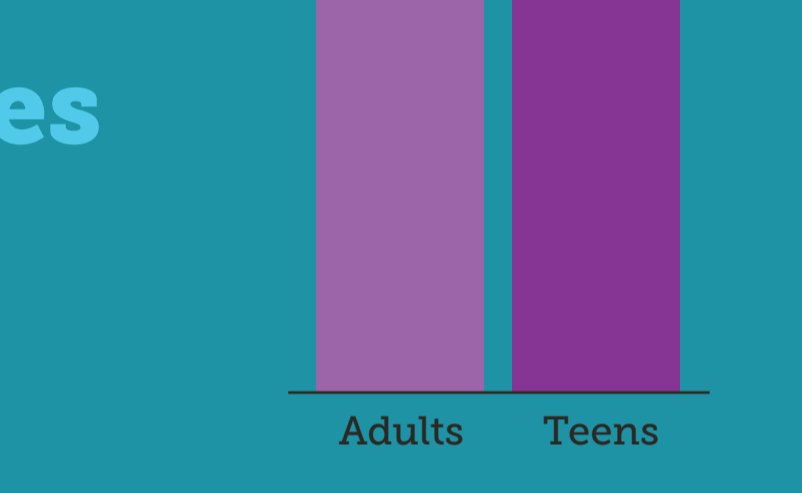
186 miles

is the distance humans walk to trade between groups, obtain materials, and cement alliances.

25,000 miles

is the circumference of the Earth: the distance humans can exchange information without taking one step.

U.S. population active on at least one social networking site



90,000 Years Ago ⚙️ Now

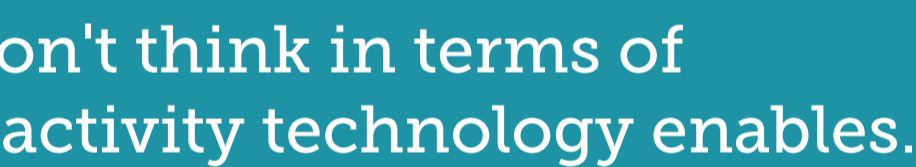
Modern humans make tools for gathering plants.

Modern humans use tools to gather information.

American adults who have a cell phone



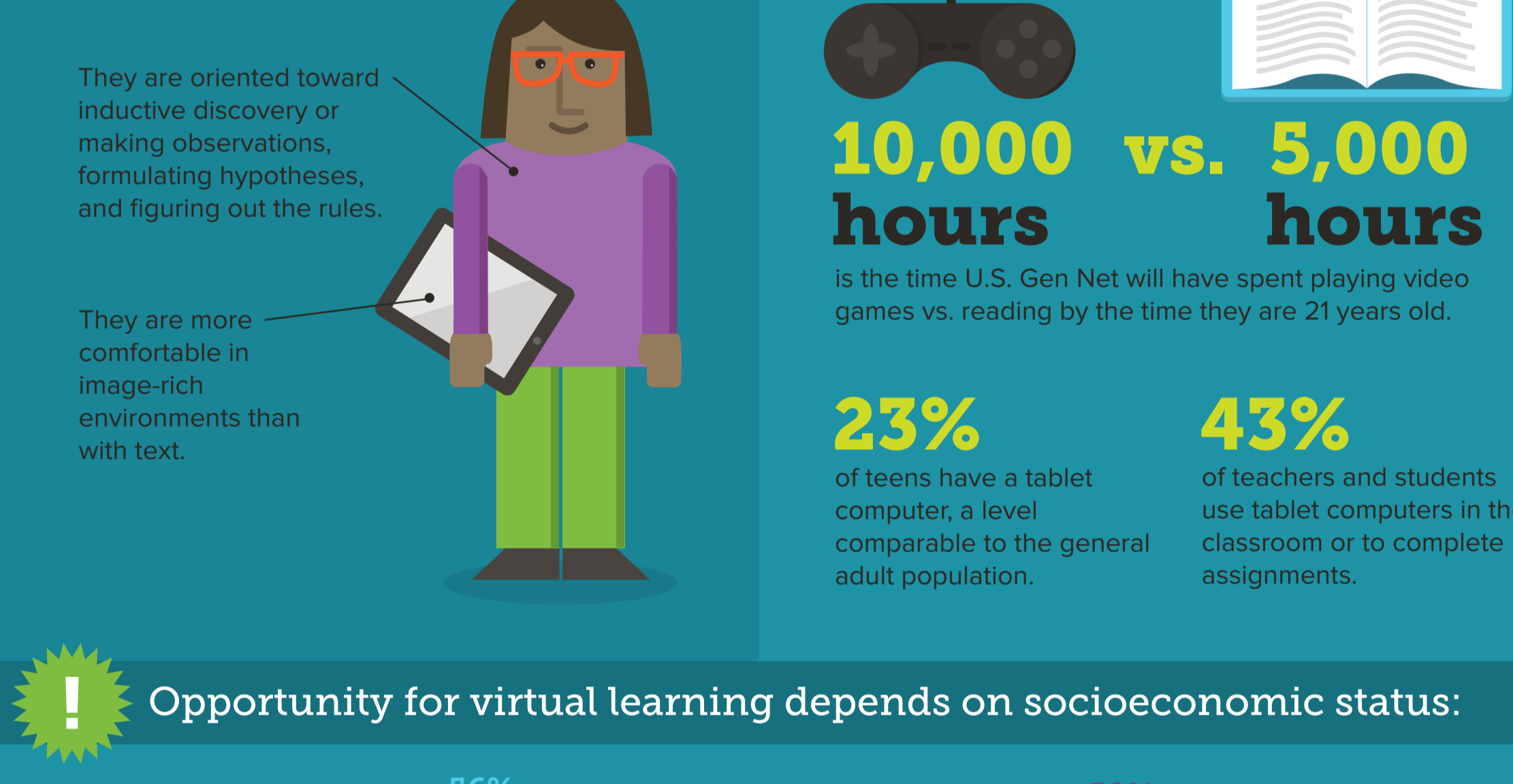
American adults who have a smartphone



American adults who have a tablet computer



Mid-1990s to Today: "Generation Net" kids are born. They don't think in terms of technology; they think in terms of the activity technology enables.



Opportunity for virtual learning depends on socioeconomic status:



12,000 Years Ago 🌾 Now

A Turning Point

Modern humans learn they can control the growth and breeding of plants and animals and discover activities that transform Earth's natural landscapes.

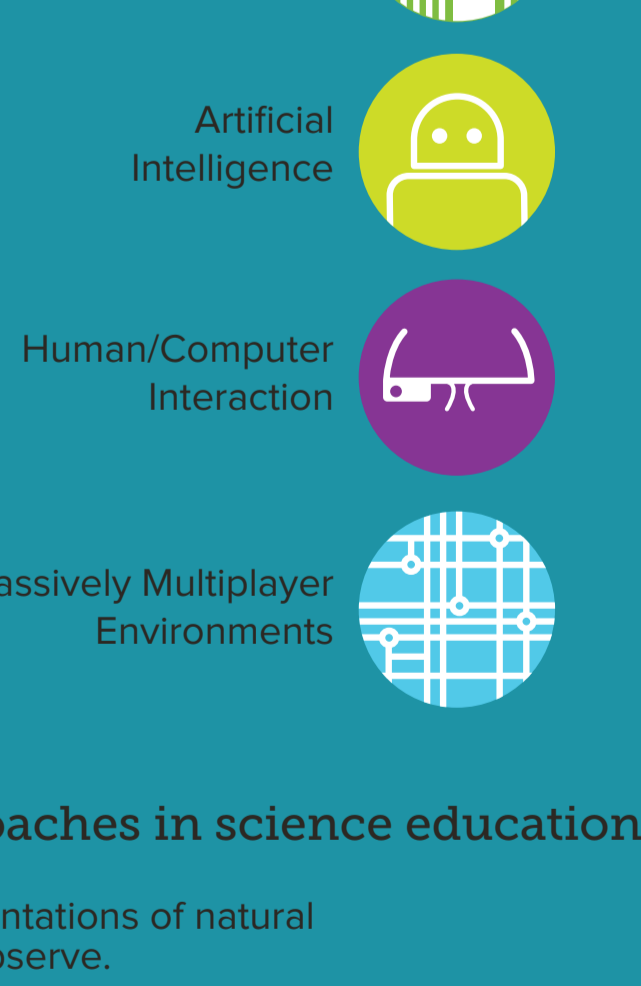
Education Game Changers

Modern humans find they can influence the growth and development of students of all ages with digital activities that are transforming learning landscapes everywhere.

170 million

Americans play video games — 55% of the U.S. population.

Games drive innovation in industry:



Computer simulations and games are catalysts to new approaches in science education:

- ✓ They enable learners to see and interact with representations of natural phenomena that would otherwise be impossible to observe.
- ✓ They motivate learners with challenges and rapid feedback.

Smithsonian Science Education Center assists in nurturing the ongoing development of tomorrow's tech-literate generation.

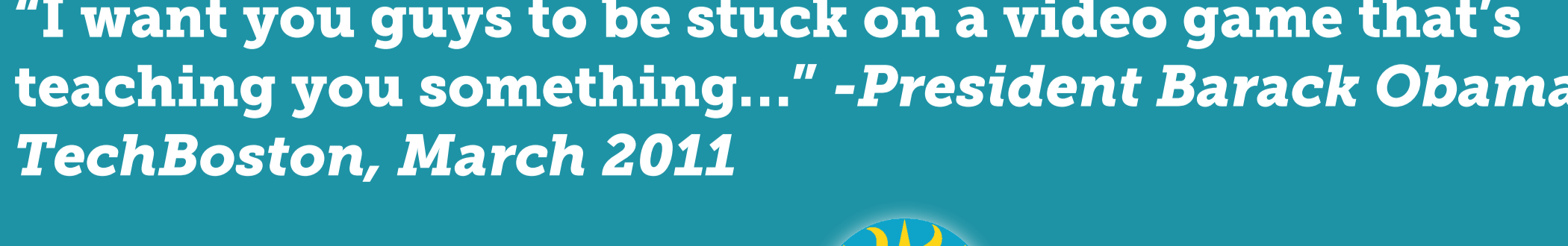
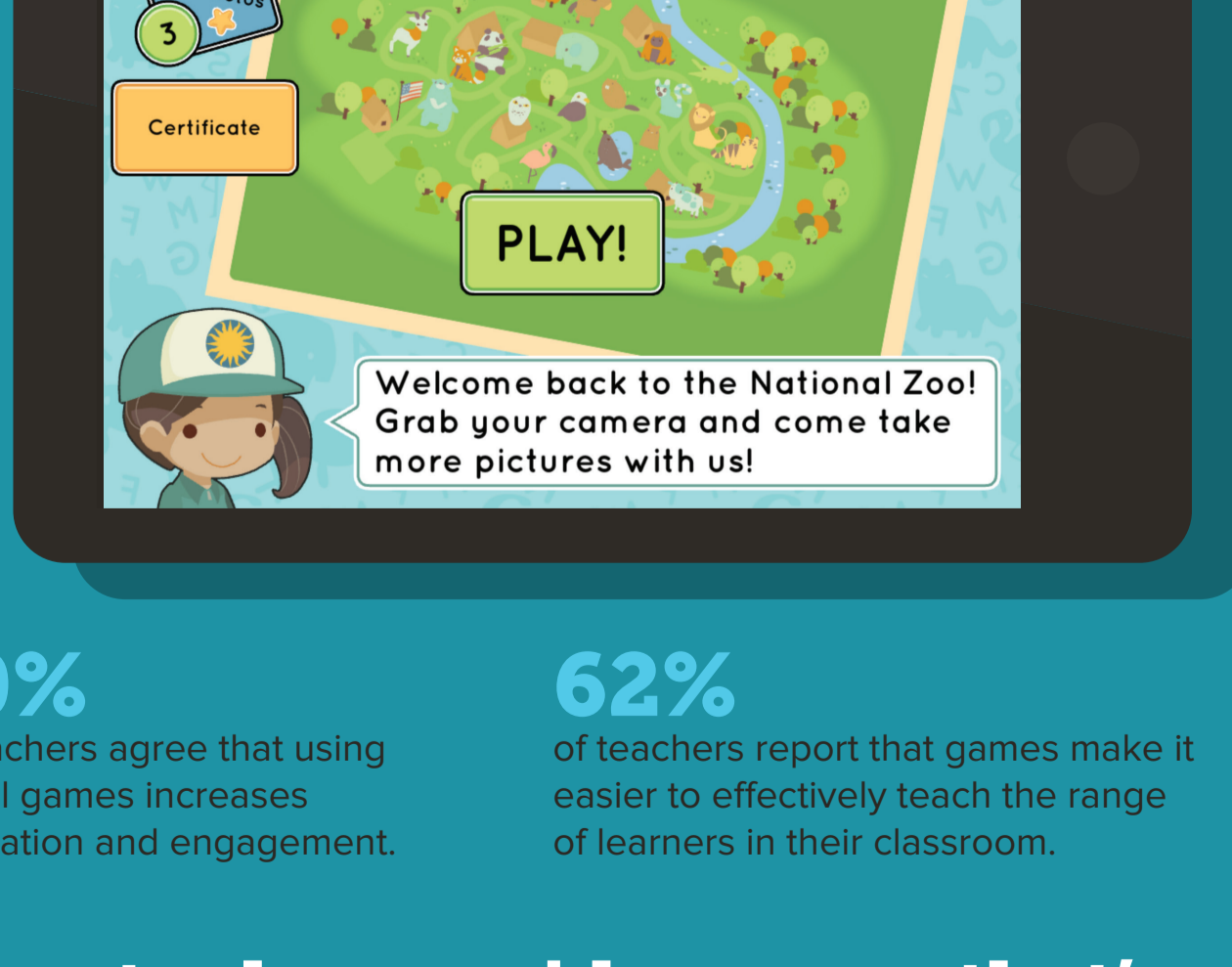
28-year legacy

in inquiry-based science, developing authentic learning materials for classrooms nationwide.

SSEC develops a science standards-aligned kindergarten app for its STC™ program called **Shutterbugs: Wiggle and Stomp**.

shutterbugs

- + adapts quickly to each player
- + provides children, parents, and teachers with feedback about the child's progress
- + works on most current research about how children learn
- + rigorously user-tested with children and educators



"I want you guys to be stuck on a video game that's teaching you something..." -President Barack Obama, TechBoston, March 2011



SOURCES: Visual.ly; Transforming Science Education, Smithsonian Science Education Center; Humans Change the World, Smithsonian Museum of Natural History; Fact Sheet: Digital Literacy, The U.S. Department of Commerce; Living and Learning with Mobile Devices; What Parents Think About Mobile Devices for Early Childhood and K-12 Learning, Grunwald Associates LLC; The Hidden STEM Economy, Brookings Institution; Is It Age or IT: First Steps Towards Understanding the Net Generation, Educause; Where are the STEM students? ASTRA, the Alliance for Science & Tech Research in America; How Teachers Are Using Technology at Home and in Their Classrooms, The Pew Research Center; Report: Social Networking, Internet & American Life Project, The Pew Research Center; Pew Internet & Mobile, Internet & American Life Project, The Pew Research Center; Teens and Technology 2013: Internet & American Life Project, The Pew Research Center; NASA, Goddard Space Flight Center; Teacher Attitudes about Digital Games in the Classroom (2012), The Joan Ganz Cooney Center at Sesame Workshop; Games For Grand Challenges, Office of Science and Technology Policy, The White House; Learning Science Through Computer Games and Simulations (2011), National Academy of Sciences