Unit V: Big Data, Privacy and Security

Content Area: **Business**
Course(s): **Introduction to Computer Science and Programing**
Time Period: **4 weeks**
Length: **Weeks**
Status: **Published**

Unit Overview

In this unit, students will learn how information is represented, collected and analyzed through individuals' online activities, weight the potential benefits and harms of new technology and research, learn the basics of encryption and its role in online shopping and banking, and develop a broad picture of the various careers relating to computing.

Transfer

Students will be able to independently use their learning to...

- explore the concept of "big data" and where it comes from
- demonstrate an understanding of how big data is used to solve problems, and how much of their lives are "datafied" or could be
- investigate some of the world's biggest data breaches to get a sense for how frequently data breaches happen and what kinds of data is lost or stolen
- analyze the threats of hacking, identity theft and other types of 'cybercrime' to individuals, companies and governments
- examine some of the economic concerns and consumer tradeoffs related to apps and websites that collect and track consumer data in exchange for providing a service free of cost
- demonstrate an understanding of the basics of how encryption works and why it is necessary
- analyze the role of encryption and attempt cracking Caesar and random substitution ciphers
- analyze the limitations of computers to crack encryption schemes. examine the various types of careers in computing and research one such career in depth

Meaning

Understandings

Students will understand that...

- Individual's online activities are analyzing and "datafied" by companies offering free online services
- This "big data" is sold to and mined by companies seeking to advertise their products through targeted ads
- Any new technology can be analyzed for its potential benefits and harms and actions taken to minimize

the risks of harms and maximize the benefits
- Hacking, identity theft and other types of cybercrime are threats introduced with the convenience of online transactions
- Encryption can be used to hide or obfuscate data from being read by third parties
- Careers in computing include computer scientists, programmers, web developers, and many specialized fields involving companies' web presence and data management and analysis

Essential Questions

Students will keep considering...

- Why is representation important in problem solving?
- What features does a representation system need to be useful?
- What is necessary to create useable binary representation systems?
- How can we combine systems together to get more complex information?
- How does data help us to solve problems? How do computers and humans use data differently?
- What parts of the data problem solving process can be automated?
- What kinds of problems do computers use data to solve in the real world?
- What opportunities do large data sets provide for solving problems and creating knowledge?
- How is cybersecurity impacting the ever-increasing number of Internet users?
- How does cryptography work?

Application of Knowledge and Skill

Students will know...

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- Individual's online activities are analyzed and "datafied" by companies offering free online services
- This "big data" is sold to and mined by companies seeking to advertise their products through targeted ads
- Any new technology can be analyzed for its potential benefits and harms and actions taken to minimize the risks of harms and maximize the benefits
- Hacking, identity theft and other types of cybercrime are threats introduced with the convenience of online transactions
- Encryption can be used to hide or obfuscate data from being read by third parties
- Careers in computing include computer scientists, programmers, web developers, and many specialized fields involving companies' web presence and data management and analysis

Students will be skilled at...

Students will be skilled at...

- citing examples of how individual's online activities are analyzed and "datafied" by companies offering free online services
- explaining the role of "big data" in today's online world
- analyzing technology for its potential benefits and harms
- explaining the dangers of hacking, identity theft and other types of cybercrime
- making decisions involving encryption and explaining when it is needed and why
- analyzing careers in computing

Academic Vocabulary
- Big Data
- Database
- Database Query
- SQL
- Search engine
- Data breach
- Hacking
- Identity theft
- Cybercrime
- Password strength
- Systems Analyst
- Database Analyst
- Software Engineer
- Phishing/social engineering attack
- Asymmetric encryption
- Private Key/Public Key Encryption

Learning Goal 1

Students will learn how information is represented/collected/analyzed, including online

CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
TECH.8.1.12.A.CS1	Understand and use technology systems.

TECH.8.1.12.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.12.D.1	Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work.
TECH.8.1.12.D.4	Research and understand the positive and negative impact of one's digital footprint.
TECH.8.1.12.D.CS1	Advocate and practice safe, legal, and responsible use of information and technology.
TECH.8.1.12.E.2	Research and evaluate the impact on society of the unethical use of digital tools and present your research to peers.
TECH.8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
TECH.8.2.12.B.3	Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs.
TECH.8.2.12.C.1	Explain how open source technologies follow the design process.
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Target 1
Students will explore the concept of "big data" and where it comes from

Target 2
Students will understand how big data is used to solve problems, and how much of their lives are "datafied" or could be.

Learning Goal 2
Students will weigh the potential benefits and harms of new technology and research current events related to public policy, law, ethics, and societal impact.

CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
TECH.8.1.12.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.12.D.3	Compare and contrast policies on filtering and censorship both locally and globally.
TECH.8.1.12.D.4	Research and understand the positive and negative impact of one's digital footprint.
TECH.8.1.12.D.5	Analyze the capabilities and limitations of current and emerging technology resources and

	assess their potential to address personal, social, lifelong learning, and career needs.
TECH.8.1.12.D.CS1	Advocate and practice safe, legal, and responsible use of information and technology.
TECH.8.1.12.E.2	Research and evaluate the impact on society of the unethical use of digital tools and present your research to peers.
TECH.8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
TECH.8.2.12.B.3	Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs.
TECH.8.2.12.C.7	Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process through drawings that include data and materials.
TECH.8.2.12.C.CS3	The role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.

Target 1

Students will investigate some of the world's biggest data breaches to get a sense of the risks of data breaches, what kinds of data is lost or stolen, and strategies to prevent data breaches.

Target 2

Students will analyze the threats of hacking, identity theft and other types of 'cybercrime' to individuals, companies and governments.

Target 3

Students will examine ethical issues in computing, cincluding the consumer tradeoffs related to apps and websites that collect and track consumer data in exchange for providing a service free of cost.

Learning Goal 3

Students will learn the basics of how encryption works and why it is necessary

CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.D.3	Compare and contrast policies on filtering and censorship both locally and globally.
TECH.8.1.12.E.2	Research and evaluate the impact on society of the unethical use of digital tools and

	present your research to peers.
TECH.8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).

Target 1

Students are introduced to encryption and attempt cracking Caesar and random substitution ciphers.

Target 2

Students will analyze the security of various encryption schemes and the limitations of computers to 'crack' encryption schemes.

Learning Goal 4

Students will have a broad picture of the various careers related to computing

TECH.8.1.12.D.5	Analyze the capabilities and limitations of current and emerging technology resources and assess their potential to address personal, social, lifelong learning, and career needs.
TECH.8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

Target 1

Students will examine the various types of careers in computing, the required qualifications and education, and research one such career in depth

Summative Assessment

- Quizzes & Tests
- Applied Projects

- Classroom Survey

Formative Assessment and Performance Opportunities

- Applied Activities/Projects
- Guided Practice
- Peer Review
- Reflective Discussion
- Teacher Observation
- Oral Questioning

Accommodations/Modifications

- Application problems for extra practice
- Scenarios for critical thinking
- Research an important topic in the impact and ethical use of technology

Unit Resources

Internet Resources

- Code.org's encryption widgets
- Code.org's Computer Science Discoveries-Unit 5 curriculum
- Code.org's Computer Science Principles-Unit 4 curriculum
    - *Some of the language in the Learning Goals, Targets and Essential Questions in these units borrows from or has been adapted from Code.org's curricula for its Computer Science Discoveries and Computer Science Principles courses, which are licensed via a Creative Commons license (Attribution-NonCommercial-ShareAlike 4.0 International-CC BY-NC-SA 4.0).*

Technology Software & Hardware

- Desktop computers
- Python programming language and IDE (Integrated Development Environment)

Textbooks (Online, pdf or print)

- Downey, Allen. *Think Python: How to Think Like a Computer Scientist* (2nd Edition). Needham, Massachusetts: Green Tea Press, 2015. http://www.thinkpython2.com.
- Abelson, Hal et al. *Blown to Bits: Your Life, Liberty and Happiness after the Digital Explosion.* Upper Saddle River, NJ: Addison-Wesley, 2008. http://www.bitsbook.com/excerpts

Relevant Videos

- Code.org's video library

Interdisciplinary Connections

LA.RH.11-12.8	Evaluate an author's claims, reasoning, and evidence by corroborating or challenging them with other sources.
LA.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.
LA.RST.11-12.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.5	Use appropriate tools strategically.