

Unit 5: Big Idea 5: Impact of Computing

Content Area: **Business/Tech.**
Course(s): **Advanced Placement Computer Science Principals**
Time Period: **March**
Length: **3 weeks**
Status: **Published**

Unit Overview:

Computers and computing have revolutionized our lives. To use computing safely and responsibly, we need to be aware of privacy, security, and ethical issues. As programmers, we need to understand the potential impacts of our programs and be responsible for the consequences. As computer users, we need to understand any potential beneficial or harmful effects and how to protect ourselves and our privacy when using a computer.

Enduring Understandings:

- The use of computing innovations may involve risks to personal safety and identity
- While computing innovations are typically designed to achieve a specific purpose, they may have unintended consequences.

Essential Questions:

- Are innovators responsible for the harmful effects of their computing innovations, even if those effects were unintentional? Why or why not?
- What app or computer software do you use most often and would have a hard time going without? How does this software solve a problem for you or benefit you?
- What data are generated by smart phones, and what are they being used for?

Standards/Indicators/Student Learning Objectives (SLOs):

ITEC.9-12.9.4.12.K.(1).1	Identify and analyze an individual's or a business organization's network system needs and requirements to design a network.
ITEC.9-12.9.4.12.K.(1).2	Analyze a network system to determine if it meets specifications.
ITEC.9-12.9.4.12.K.(2).1	Perform user support to maintain service.
ITEC.9-12.9.4.12.K.(2).2	Manage software systems to maintain and update service.
ITEC.9-12.9.4.12.K.(4).1	Identify and analyze customer software needs and requirements to guide programming and software development.
ITEC.9-12.9.4.12.K.(4).2	Create and use information technology strategies and project plans when solving specific problems to deliver a product that meets customer specifications.
ITEC.9-12.9.4.12.K.(4).3	Identify and analyze system and software requirements to ensure maximum operating efficiency.
ITEC.9-12.9.4.12.K.(4).4	Demonstrate the effective use of software development tools to develop software applications.

ITEC.9-12.9.4.12.K.(4).5	Use the software development process to design a software application and deliver it to the customer.
ITEC.9-12.9.4.12.K.(4).6	Produce a computer application, in code, to demonstrate proficiency in developing an application using the appropriate programming language.
ITEC.9-12.9.4.12.K.(4).7	Implement software testing procedures to ensure quality products.
ITEC.9-12.9.4.12.K.(4).8	Perform quality assurance tasks to produce quality products.
ITEC.9-12.9.4.12.K.(4).9	Perform maintenance and customer support functions to maintain software applications.
ITEC.9-12.9.4.12.K.(4).10	Develop and maintain a database to store information.
ITEC.9-12.9.4.12.K.1	Demonstrate language arts knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
ITEC.9-12.9.4.12.K.4	Select and employ appropriate reading and communication strategies to learn and use technical concepts and vocabulary in practice.
ITEC.9-12.9.4.12.K.5	Demonstrate use of the concepts, strategies, and systems for obtaining and conveying ideas and information to enhance communication.
ITEC.9-12.9.4.12.K.6	Locate, organize, and reference written information from various sources to communicate with others.
ITEC.9-12.9.4.12.K.7	Evaluate and use information resources to accomplish specific occupational tasks.
ITEC.9-12.9.4.12.K.8	Use correct grammar, punctuation, and terminology to write and edit documents.
ITEC.9-12.9.4.12.K.9	Develop and deliver formal and informal presentations using appropriate media to engage and inform audiences.
ITEC.9-12.9.4.12.K.10	Interpret verbal and nonverbal cues/behaviors to enhance communication.
ITEC.9-12.9.4.12.K.11	Apply active listening skills to obtain and clarify information.
ITEC.9-12.9.4.12.K.12	Develop and interpret tables, charts, and figures to support written and oral communications.
ITEC.9-12.9.4.12.K.13	Listen to and speak with diverse individuals to enhance communication skills.
ITEC.9-12.9.4.12.K.14	Exhibit public relations skills in order to increase internal and external customer satisfaction.
ITEC.9-12.9.4.12.K.15	Demonstrate how to develop positive customer relations to build and maintain a customer base in this cluster.
ITEC.9-12.9.4.12.K.16	Demonstrate how to perform scheduling functions to meet customer needs in this cluster.
ITEC.9-12.9.4.12.K.17	Employ critical thinking skills (e.g., analyze, synthesize, and evaluate) independently and in teams to solve problems and make decisions.
ITEC.9-12.9.4.12.K.18	Employ critical thinking and interpersonal skills to resolve conflicts.
ITEC.9-12.9.4.12.K.19	Identify, write, and monitor performance goals to guide progress in assigned areas of responsibility and accountability.
ITEC.9-12.9.4.12.K.20	Conduct technical research to gather information necessary for decision-making.
ITEC.9-12.9.4.12.K.21	Use information technology design processes and guidelines to produce a quality information technology product or service.
ITEC.9-12.9.4.12.K.22	Implement problem-solving processes to evaluate and verify the nature of problems in this cluster.
ITEC.9-12.9.4.12.K.23	Employ organizational and design principles to sort and group information used in this cluster.
ITEC.9-12.9.4.12.K.26	Operate Internet applications to perform tasks.
ITEC.9-12.9.4.12.K.27	Operate writing and publishing applications to prepare communications.

ITEC.9-12.9.4.12.K.28	Operate presentation applications to prepare and deliver presentations.
ITEC.9-12.9.4.12.K.32	Employ computer operations applications to manage tasks.
ITEC.9-12.9.4.12.K.33	Use computer-based equipment (containing embedded computers or processors) to control devices.
ITEC.9-12.9.4.12.K.39	Demonstrate knowledge of personal and jobsite safety rules and regulations to maintain safe and healthful working conditions and environments.
ITEC.9-12.9.4.12.K.45	Employ leadership skills to accomplish goals and objectives.
ITEC.9-12.9.4.12.K.46	Employ organizational skills to foster positive working relationships and accomplish organizational goals.
ITEC.9-12.9.4.12.K.47	Employ teamwork skills to achieve collective goals and use team members' talents effectively.
ITEC.9-12.9.4.12.K.48	Establish and maintain effective relationships in order to accomplish objectives and tasks.
ITEC.9-12.9.4.12.K.49	Conduct and participate in meetings to accomplish tasks.
ITEC.9-12.9.4.12.K.50	Employ mentoring skills to assist others.
ITEC.9-12.9.4.12.K.51	Apply ethical reasoning to a variety of situations in order to make ethical decisions.
ITEC.9-12.9.4.12.K.52	Interpret and explain written organizational policies and procedures that help workers perform their tasks according to employer rules and expectations.
ITEC.9-12.9.4.12.K.53	Apply standard practices and behaviors that meet legal and ethical requirements and exhibit positive cyber-citizenry to demonstrate understanding of legal issues faced by professionals in this cluster.
ITEC.9-12.9.4.12.K.54	Identify and demonstrate positive work behaviors and personal qualities needed to succeed in the classroom and/or to be employable.
ITEC.9-12.9.4.12.K.55	Develop a Personalized Student Learning Plan to meet career goals and objectives.
ITEC.9-12.9.4.12.K.56	Demonstrate skills related to seeking and applying for employment in a desired job.
ITEC.9-12.9.4.12.K.57	Maintain a career portfolio to document knowledge, skills, and experience in a career field.
ITEC.9-12.9.4.12.K.58	Demonstrate skills in evaluating and comparing employment opportunities in order to accept employment positions that match career goals.
ITEC.9-12.9.4.12.K.59	Identify and exhibit traits for retaining employment.
ITEC.9-12.9.4.12.K.68	Demonstrate knowledge of the hardware components associated with information systems.
ITEC.9-12.9.4.12.K.72	Demonstrate technical knowledge of the Internet to develop and maintain information technology systems.
ITEC.9-12.9.4.12.K.73	Access and use Internet services to service and update information technology systems and to complete other information technology tasks.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
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.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.

TECH.8.1.12.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.12.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
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.

Lesson Titles:

- Activity: It's Just Bits
- Activity: Pecha Kucha Presentation on the Internet
- Classwork: Exploring Innovations Jigsaw Worksheet
- Classwork/Homework: Exploring Innovations - Impact on Computing
- Homework: Blown to Bits

Career Readiness, Life Literacies, & Key Skills

12.9.3.IT-PRG.1	Analyze customer software needs and requirements.
12.9.3.IT-PRG.2	Demonstrate the use of industry standard strategies and project planning to meet customer specifications.
12.9.3.IT-PRG.3	Analyze system and software requirements to ensure maximum operating efficiency.
12.9.3.IT-PRG.4	Demonstrate the effective use of software development tools to develop software applications.
12.9.3.IT-PRG.5	Apply an appropriate software development process to design a software application.
12.9.3.IT-PRG.6	Program a computer application using the appropriate programming language.
12.9.3.IT-PRG.7	Demonstrate software testing procedures to ensure quality products.
12.9.3.IT-PRG.8	Perform quality assurance tasks as part of the software development cycle.
12.9.3.IT-PRG.9	Perform software maintenance and customer support functions.
12.9.3.IT-PRG.10	Design, create and maintain a database.
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

TECH.9.4.12.CT	Critical Thinking and Problem-solving
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3). Innovative ideas or innovation can lead to career opportunities. With a growth mindset, failure is an important part of success. Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.

Inter-Disciplinary Connections:

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.
LA.RST.11-12.2	Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LA.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
LA.RST.11-12.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
LA.RST.11-12.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
LA.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
LA.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
LA.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
LA.RST.11-12.10	By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
LA.WHST.11-12.1.A	Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
LA.WHST.11-12.2.A	Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
MA.A-REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
LA.WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

MA.A-REI.C.5	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
LA.WHST.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
MA.A-REI.C.8	Represent a system of linear equations as a single matrix equation in a vector variable.
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
SCI.HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
SCI.HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
SOC.9-12.1.1.1	Compare present and past events to evaluate the consequences of past decisions and to apply lessons learned.
SOC.9-12.1.1.2	Analyze how change occurs through time due to shifting values and beliefs as well as technological advancements and changes in the political and economic landscape.
SOC.9-12.1.3.1	Distinguish valid arguments from false arguments when interpreting current and historical events.
VPA.1.3.12.B.CS1	Technical accuracy, musicality, and stylistic considerations vary according to genre, culture, and historical era.
VPA.1.3.12.D.CS1	How individuals manipulate the elements of art and principles of design results in original portfolios that reflect choice and personal stylistic nuance.

Equity Considerations

LGBTQ and Disabilities Mandate

Topic: LGBT Computer scientists

Materials Used: <https://medium.com/@sudolabs/5-lgbt-computer-scientists-you-should-know-f9dbacabbb4c>

Addresses the Following Component of the Mandate:

- Economic

- Political
- Social

Holocaust Mandate

Topic: Technology used during the Holocaust

Materials Used: <http://www2.iath.virginia.edu/holocaust/infotech.html>

Addresses the Following Component of the Mandate:

- Bias
- Bigotry
- Bullying
- Holocaust Studies
- Prejudice

Climate Change

Topic: How Computer science can fight climate change

Materials Used: <https://www.computersciencedegreehub.com/faq/how-can-computer-science-slow-climate-change/>

Addresses the Following Component of the Mandate:

- Economic
- Political
- Social

Asian American Pacific Islander Mandate

Topic: Most influential AAPI members in Computer science

Materials Used: <https://www.computerscience.org/resources/most-influential-asians-pacific-islanders-computer-science/>

Addresses the Following Component of the Mandate:

- Economic
- Political
- Social

Amistad

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Activity: It's Just Bits
- Activity: Pecha Kucha Presentation on the Internet
- Classwork: Exploring Innovations Jigsaw Worksheet
- Classwork/Homework: Exploring Innovations - Impact on Computing
- Homework: Blown to Bits
- IS: • Extra Time to complete Programs
- IS: • NHS Assistance and Tutoring
- IS: • One on One tutoring during Delsea One

Modifications

ELL Modifications:

- Choice of test format (multiple-choice, essay, true-false)
- Continue practicing vocabulary
- Provide study guides prior to tests
- Read directions to the student
- Read test passages aloud (for comprehension assessment)
- Vary test formats

IEP & 504 Modifications:

- Allow for redos/retakes
- Assign fewer problems at one time (e.g., assign only odds or evens)
- Differentiated center-based small group instruction
- Extra time on assessments
- Highlight key directions
- If a manipulative is used during instruction, allow its use on a test
- Opportunities for cooperative partner work
- Provide reteach pages if necessary
- Provide several ways to solve a problem if possible
- Provide visual aids and anchor charts
- Test in alternative site
- Tiered lessons and assignments
- Use of a graphic organizer
- Use of concrete materials and objects (manipulatives)
- Use of word processor

G&T Modifications:

- Alternate assignments/enrichment assignments
- Enrichment projects
- Extension activities
- Higher-level cooperative learning activities
- Pairing direct instruction with coaching to promote self-directed learning
- Provide higher-order questioning and discussion opportunities
- Provide texts at a higher reading level
- Tiered assignments
- Tiered centers

At Risk Modifications

- Additional time for assignments
- Adjusted assignment timelines
- Agenda book and checklists
- Answers to be dictated
- Assistance in maintaining uncluttered space
- Books on tape
- Concrete examples

- Extra visual and verbal cues and prompts
- Follow a routine/schedule
- Graphic organizers
- Have students restate information
- No penalty for spelling errors or sloppy handwriting
- Peer or scribe note-taking
- Personalized examples
- Preferential seating
- Provision of notes or outlines
- Reduction of distractions
- Review of directions
- Review sessions
- Space for movement or breaks
- Support auditory presentations with visuals
- Teach time management skills
- Use of a study carrel
- Use of mnemonics
- Varied reinforcement procedures
- Work in progress check

Benchmark Assessments

Skills-based assessment

Reading response

Writing prompt

Lab practical

Alternative Assessments

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Reflective pieces

Concept maps

Case-based scenarios

Portfolios

Formative Assessment:

- Abstraction Journal
- Anticipatory Set
- Closure
- Pre-Programs
- Program Examples
- Teacher/Student Review
- Warm-Up

Summative Assessment:

- Alternate Assessment
- Benchmark
- Classwork/Homework
- Group Programs
- Large Programs
- Marking Period Assessment
- Small Programs

Resources & Materials:

- • Various Additional Web Sites
- • Visual Studios Express software
- Blown to Bits - Abelson, Ledeen, Lewis
- Canvas
- Class Dojo
- Code.org
- Computer Labs
- CSMatters
- Earsketch
- Microsoft Office
- Microsoft Visual Basic
- Photoshop
- Quizlet
- Repl.it
- Screen Sharing Software

Technology:

- Canvas
- Chromebooks
- Computer Lab
- Earsketch
- Google Classroom
- Photoshop
- Snap!
- Visual Studios IDE
- World Wide Web

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
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.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.12.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.12.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
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.