NEW YORK STATE EDUCATION DEPARTMENT
MIDDLE LEVEL CAREER AND TECHNICAL EDUCATION

COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

THE COMPUTATIONAL WORLD CONTENT MODULE

UPDATED MAY 2023

MODULE DESCRIPTION

The Computational World introduces students to the hardware, software, and networking capabilities that are evolving to impact our ever-changing world. Networked computing systems affect how we develop and maintain relationships, how we share and find information, collaborate, and work.

In this module, students will be exposed to the history of computing and how innovations impacted the evolution of computing and society's use of computing. Students will consider the benefits of extending humankind's capabilities and unintended consequences of computing innovations. They will develop their understanding of computer hardware, software, and networked systems. Students will develop an appreciation of the roles and capabilities of our networked world, and the various ways in which digital citizens may contribute and participate in that world.

GUIDING QUESTION

What skills, knowledge, and attitudes are necessary for students to demonstrate successful understanding of the computational world and to develop them into ethical consumers and creators of computational systems?

MODULE CONTENT

1. IMPACT OF COMPUTING ON SOCIETY

STUDENTS WILL:
a) Describe how computing technology has changed the way people communicate
b) Identify significant innovations in computing
c) Explain the impacts that innovations in computing have had on society
d) Identify and differentiate how current computing devices have changed the workplace
e) Investigate various laws and regulations that address the intended and unintended impacts of computing technology (i.e., HIPAA, Gramm-Leach-Bliley Act, etc.)

2. ETHICS OF COMPUTING

STUDENTS WILL:
a) Identify current events involving ethics and computing
b) Describe issues related to the collection and use of public and private data
c) Assess the strengths and weaknesses of a software program in terms of accessibility

d) Redesign computational artifacts such as spreadsheets, documents, or web sites to be more accessible to different users
e) Demonstrate an understanding of empathy in seeing how a computational artifact, device, or program is experienced by different users

3. COMPUTER HARDWARE AND SOFTWARE

STUDENTS WILL:
a) Identify the key hardware components of computational devices
b) Demonstrate use of troubleshooting skills to solve common problems with computational devices
c) Identify and describe components common in user and systems software and how they are connected to the use, functionality, and accessibility of the application
d) Identify how the design of a graphical user interface can impact the ease of learning, desirability, and accessibility of a software application

4. NETWORK SOFTWARE AND SYSTEM DESIGN

STUDENTS WILL:
a) Explain why protocols are needed for successful network communication
b) Describe how protocols support the scalability and resilience of the Internet
c) Differentiate between local and remote resources
d) Visualize the systems involved in facilitating data transmission between computing devices

5. CAREERS INVOLVING COMPUTER SCIENCE

STUDENTS WILL:
a) Explain roles and functions of individuals in computer science careers
b) Investigate education, training requirements, and opportunities for career paths in fields in which computer science skills are required
c) Identify the computer science skills, knowledge, and understanding needed for success in a given career
d) Assess personal competencies for careers requiring computational thinking and evaluate personal interest and suitability for such careers

ILLUSTRATIVE ACTIVITIES BY THEME MODULE

These activities are intended to serve as examples of how the content in this module could be tied to each of the six middle level themes.

CAREER AND COMMUNITY OPPORTUNITIES

HOW COMPUTER SCIENCE SKILLS IMPACT CAREERS

Students will investigate and report on how computer science concepts, skills, and knowledge can be applied to a particular career of interest. Students may choose a field of computer science or an occupation that uses computer science as a component attribute. Students will include the benefits of that occupation to self and society. Products may include a presentation, slides, video, web page, or other computational artifact.

COMMUNICATION AND INTERPERSONAL RELATIONSHIPS

SAFE COMMUNICATION BY CONTEXT

Students identify scenarios in which they need to safely communicate information. This could include communication between students, students with teachers, students with family, and students with professionals. They will compare and contrast the network communication systems that students would have used in the past vs. today to communicate the message.

FINANCIAL AND CONSUMER LITERACY

SELECTING AND EVALUATING COMPUTATIONAL DEVICES

Students create a proposal for new computers in the school by analyzing the requirements, decomposing the necessary internal computer hardware components, and researching the prices. Students will then present their proposal and reasoning to school administration or information technology staff.

HEALTH, SAFETY, AND WELLNESS

MAKING THE COMPUTING WORLD ACCESSIBLE

Students will assess the ways in which an application promotes or impedes accessibility by users with varying challenges. They will redesign that application to improve accessibility for different users and present their ideas for peer review.

PROBLEM SOLVING AND INNOVATION

COMMUNICATING WITH LIMITED RESOURCES

Groups of students invent a communication system to send several messages using only six envelopes and a deck of cards. All groups in the class begin sending the same messages and analyze the successes, failures, and challenges. The various group solutions are compared with Internet protocols and systems.

SUSTAINABILITY

COMPARING SUSTAINABILITY

Students will research the components of digital devices, identifying some of the significant materials that are needed for production. They will analyze those resources for various characteristics such as recyclability, toxicity, use of restricted resources, and methods of creating/mining/gathering them. Students will explore some of the impacts of regulations of acquiring the raw materials.

STANDARDS ADDRESSED

NEW YORK STATE CAREER DEVELOPMENT AND OCCUPATIONAL STUDIES (CDOS) STANDARDS

STANDARD 1: CAREER DEVELOPMENT

Students will be knowledgeable about the world of work, explore career options, and relate personal skills, aptitudes, and abilities to future career decisions

STANDARD 2: INTEGRATED LEARNING

Students will demonstrate how academic knowledge and skills are applied in the workplace and other settings

STANDARD 3A: UNIVERSAL FOUNDATION SKILLS

Students will demonstrate mastery of the foundation skills and competencies essential for success in the workplace

COMMON CAREER TECHNICAL CORE STANDARDS

CAREER READY PRACTICES

1. Act as a responsible and contributing citizen and employee
2. Apply appropriate academic and technical skills

3. Attend to personal health and financial well-being

4. Communicate clearly and effectively with reason

5. Consider the environmental, social, and economic impacts of decisions

6. Demonstrate creativity and innovation

7. Employ valid and reliable research strategies

8. Utilize critical thinking to make sense of problems and persevere in solving them

9. Model integrity, ethical leadership, and effective management

10. Plan education and career paths aligned to personal goals

11. Use technology to enhance productivity

12. Work productively in teams while using cultural global competence

NYS COMPUTER SCIENCE AND DIGITAL FLUENCY STANDARDS

IMPACTS OF COMPUTING
- 4-6.IC.1: Describe computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices.
- 7-8.IC.1: Compare and contrast tradeoffs associated with computing technologies that affect individuals and society.
- 4-6.IC.2: Explain how laws impact the use of computing technologies and digital information.
- 7-8.IC.2: Evaluate the impact of laws or regulations on the development and use of computing technologies and digital information.
- 4-6.IC.3: Explain current events that involve computing technologies.
- 7-8.IC.3: Identify and discuss issues of ethics surrounding computing technologies and current events.
- 4-6.IC.4: Explain who has access to data in different digital spaces.
- 7-8.IC.4: Identify and discuss issues related to the collection and use of public and private data.
- 4-6.IC.5: Explain how computer systems play a role in human decision-making.
- 7-8.IC.5: Analyze potential sources of bias that could be introduced to complex computer systems and the potential impact of these biases on individuals.
- 4-6.IC.6: Identify and explain ways to improve the accessibility and usability of a computing device or software application for the diverse needs and wants of users.
- 7-8.IC.6: Assess the accessibility of a computing device or software application in terms of user needs.
- 4-6.IC.7: Identify a diverse range of role models in computer science.
- 7-8.IC.7: Explore a range of computer science related career paths.

NETWORKS AND SYSTEMS DESIGN
- 4-6.NSD.1: Propose improvements to the design of a computing technology based on an analysis of user interactions with that technology.

- 7-8.NSD.1: Design a user interface for a computing technology that considers usability, accessibility, and desirability.
- 4-6.NSD.2: Model how computer hardware and software work together as a system to accomplish tasks.
- 7-8.NSD.2: Design a project that combines hardware and software components.
- 4-6.NSD.3: Determine potential solutions to solve hardware and software problems using common troubleshooting strategies.
- 7-8.NSD.3: Identify and fix problems with computing devices and their components using a systematic troubleshooting method or guide.
- 4-6.NSD.4: Model how data is structured to transmit through a network.
- 7-8.NSD.4: Design a protocol for transmitting data through a multipoint network.
- 4-6.NSD.5: Describe that data can be stored locally or remotely in a network.
- 7-8.NSD.5: Summarize how remote data is stored and accessed in a network.

RESOURCES

Disclaimer: Posting of resources on this form does not constitute an endorsement from the New York State Education Department nor does it imply that the following resources are mandatory or the only ones that can be used. Teachers and administrators ensure that resources align with local policies and are responsible for choosing the resources and have the final authority, in alignment with local policies, to choose and utilize the resources that best meet the needs of their students. Questions regarding compliance with Education Law 2D should be directed to your administrator and/or chief information officer.

NYS COMPUTER SCIENCE AND DIGITAL FLUENCY (CS&DF) LEARNING STANDARDS

http://www.nysed.gov/curriculum-instruction/computer-science-and-digital-fluency-learning-standards

This webpage contains multiple resources for the CS&DF Standards. Including an excel version of the standards, glossary of terms, standards examples, as well as At-a-Glance documents by grade band.

NYS SMART START GRANT RESOURCES

http://www.nysed.gov/edtech/smart-start-grant-program

This resource includes teacher-created artifacts curated through the Smart Start Grant cohorts that focus on computer science, engineering, and educational technology.

NYS LEARNING TECHNOLOGY GRANT (LTG) RESOURCES

http://www.nysed.gov/edtech/learning-technology-grants-ltg

Resources include artifacts curated by multiple grant recipient districts that include personalized learning, technology integration, STEM activities, blended learning, computer science, and more.

CAREER AND TECHNICAL EDUCATION TECHNICAL ASSISTANCE CENTER OF NEW YORK

http://nyctecenter.org/

The Career and Technical Education Technical Assistance Center (CTE TAC) operates under a state contract to assist the New York State Education Department (NYSED) in carrying out its mission of improving the quality, access, and delivery of career and technical education through research-based methods and strategies resulting in broader CTE opportunities for all students.