

**NEW YORK STATE EDUCATION DEPARTMENT
MIDDLE LEVEL CAREER AND TECHNICAL EDUCATION
COMPUTER SCIENCE AND INFORMATION TECHNOLOGY
DATA COLLECTION AND MANAGEMENT CONTENT MODULE
UPDATED MAY 2023**



MODULE DESCRIPTION

Data drives decision-making. As technologies such as facial recognition, virtual assistants, social media, and smart vehicles become commonplace, so too does the continuous collection of data with and without our awareness. Students will learn the ways in which data is collected as well as the ways in which the use of this data impacts daily life.

The module focuses on three key aspects: how data is gathered, processed, and managed. Students will have the opportunity to explore and examine data use. Explorations will include data as it impacts health and wellness, data use for applications in industry, personal decision-making, and cultural implications of advances in data usage. Students will develop an awareness of the potential risks and benefits of the use and management of data in their lives.

GUIDING QUESTION

What do students need to understand about data collection, analysis, and management?

MODULE CONTENT

1. GENERATION OF DATA

STUDENTS WILL:

- a) Investigate how data is generated and collected by multiple sources, such as artificial intelligence (e.g., facial recognition), the Internet of Things (e.g., smart devices), social media (e.g., targeted advertising), sensors (e.g., health/wellness and environmental), and surveys.
- b) Appraise the impact of the collection, use, and persistence of this data.
- c) Identify potential biases in data collection and generation.

2. PROCESSING OF DATA

STUDENTS WILL:

- a) Utilize multiple programs and platforms to create, model, simulate, and evaluate data in spreadsheet or database format.
- b) Demonstrate multiple ways of visualizing data for an audience.
- c) Investigate how data can play a role in decision making.

3. MANAGEMENT OF DATA

STUDENTS WILL:

- a) Discover the multiple layers of data protection including encryption.
- b) Identify the data protocols involved in sharing data like email, across and within networks, and with peripheral devices.
- c) Compare and contrast data storage options and sizes (e.g., local, server or cloud storage).
- d) Utilize a database to report data in multiple ways, including mapping and other visual tools.

4. CRYPTOGRAPHY

STUDENTS WILL:

- a) Demonstrate an understanding of the basics of cryptography
- b) Describe the limitations of cryptographic methods

5. CAREERS INVOLVING DATA COLLECTION AND MANAGEMENT

STUDENTS WILL:

- a) Explain roles and functions of individuals engaged in careers involving data collection and management
- b) Investigate education, training requirements, and opportunities for career paths in data collection and management.
- c) Assess personal employability skills for careers in data collection and management and evaluate personal 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

USE OF DATA IN LOCAL CAREERS

Students will identify careers where data is extensively utilized. They will investigate and report on the use of data in various careers within their community. Students will survey and/or interview community members to identify essential knowledge, skills, and training to work with data in explored careers.

COMMUNICATION AND INTERPERSONAL RELATIONSHIPS

IMPROVING SCHOOL CULTURE AND CLIMATE

Students will design a form to collect data about their school culture/climate. Students will use the data to communicate the results of the survey and will propose changes or activities for improvement.

FINANCIAL AND CONSUMER LITERACY

TRACKING FINANCIAL DATA

Students will use a spreadsheet to input data involving either a job with a salary and financial responsibilities to manage their budget, or to access stock market data on a chosen company over a period of time. They will then use the gathered data to track spending or stock price trends and present their findings using visual representations (graphs or charts).

HEALTH, SAFETY, AND WELLNESS

MY WELLNESS PLAN

Students will choose a personal habit to track such as step count, screen time, or social media use and collect the data over a period of time using a digital tool. Students will compare their results with national averages and trends. Then students will reflect on their behavior and develop a personal wellness plan to address any found concerns or needs.

PROBLEM SOLVING AND INNOVATION

IDENTIFYING BIASES IN DATA

Students will identify and discuss problems and issues related with limited scope and error in data gathering. This could include problems such as facial recognition failures, bias, and data set inconsistencies. After gathering relevant data and/or information, students will propose solutions to mitigate the problem or issue.

SUSTAINABILITY

CLIMATE CHANGE

Using data from the National Oceanic and Atmospheric Administration, or something similar, students will create a spreadsheet. They will graph temperature to show changes and trends

over time. Students will persuade an audience about the implications of what the data set shows.

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.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.IC5: 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.
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COMPUTATIONAL THINKING

- 7-8.CT.1 Compare the results of alternative models or simulations to determine and evaluate how the input data and assumptions change the results.
 - 4-6.CT.2 Collect digital data related to a real-life question or need.
 - 7-8.CT.2 Collect and use digital data in a computational artifact.
 - 4-6.CT.3 Visualize a simple data set in order to highlight relationships and persuade an audience.
 - 7-8.CT.3 Refine and visualize a data set in order to persuade an audience.
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NETWORKS AND SYSTEMS DESIGN

- 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 multi-point 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.
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CYBERSECURITY

- 4-6.CY.4: Model and explain the purpose of simple cryptographic methods.
 - 7-8.CY.4: Describe the limitations of cryptographic methods.
 - 4-6.CY.5: Explain suspicious activity of applications and devices
 - 7-8.CY.5: Describe actions to be taken before and after an application or device reports a security problem or performs unexpectedly.
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DIGITAL LITERACY

- 4-6.DL.6 Describe persistence of digital information and explain how actions in online spaces can have consequences.
- 7-8.DL.6 Explain the connection between the persistence of data on the Internet, personal online identity, and personal privacy.

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.

SAMPLE DATA SETS

The following free data sets have been included in this module as examples of free, publicly available data that may be used in developing learning experiences for students.

U.S. CENSUS BUREAU

<https://www.census.gov/programs-surveys/sis/resources/data-tools/teach-with-data-tools.html>

The Census Bureau provides a variety of data tools that allow students and teachers to see customized data on housing, population, age, sex, race, ethnicity, geographic location, and much more. There are activities based on these data tools that allow teachers to utilize the tools in a classroom activity.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

<https://www.noaa.gov/education/resource-collections/data/classroom-ready>

NOAA data collected around the globe in formats designed just for educators. These resources take information from our atmosphere and ocean and package it in easily accessible, classroom-friendly lesson plans, activities, and curricula.

SMITHSONIAN ENVIRONMENTAL JUSTICE

<https://storymaps.arcgis.com/stories/7ab17716714649a28861e523dce3a035>

This website is a companion to the Smithsonian Science for Global Goals guide. This site provides a variety of data sources to help students explore questions surrounding the creation of healthy environments.

NATIONAL CENTER FOR EDUCATION STATISTICS (NCES)

<https://nces.ed.gov/>

This source provides classroom-ready charts, graphs, and data for use in lessons.