Unit 1: Digital Information and the Internet

Content Area: **Technology**
Course(s):
Time Period: **Marking Period 1**
Length: **10 blocks**
Status: **Published**

Course Description & Instructional Notes

Course Description

In this unit, students will learn about the various ways we represent information digitally. Topics covered include number systems, encoding data, programmatically creating pixel images, comparing data encodings, compressing and encrypting data. This unit also explores the structure and design of the internet, and how this design affects the reliability of network communication, the security of data, and personal privacy.

Prior Knowledge:

none

Instructional Notes:

The course utilizes a blended classroom approach. The content is a mix of web-based and physical activities. Students will write and run code in the browser, create websites and digital presentations, and engage in in-person collaborative exercises with classmates. Teachers utilize tools and resources provided by CodeHS to leverage time in the classroom and give focused 1-on-1 attention to students.

Technology Integration:

Computer Science naturally integrates technology on a daily basis.

Enduring Understandings

Computer systems and networks facilitate the transfer of data.
Parallel and distributed computing leverage multiple computers to more quickly solve complex problems or process large data sets

Essential Questions

Why are long text messages sometimes delivered out of order?

When an Internet service outage occurs in a different part of your town or city, how are you still able to access the Internet?

Student Learning Objectives

Students will be able to:

- Explore and explain abstraction and the different ways that we can represent digital information
- Represent numbers in different number systems
- Understand the binary system and convert numbers to and from decimal form
- Encode various types of information using binary
- Understand how images can be encoded as data
- Understand how to convert between the hexadecimal and binary system
- Encode colors
- Encode color images as data
- Include images in their programs
- Manipulate the stored pixel data arbitrarily
- Understand what the internet is and how it works
- Discuss the issue of anonymity
- Understand the legal and ethical concerns surrounding internet censorship
- Discuss and answer questions about the hardware that powers the internet
- Discuss the necessity of internet protocols
- Recognize the hierarchy of elements in an IP address
- Understand the DNS system and how it works and recognize it as an abstraction
- Explain how computers communicate using routers and what considerations are made when choosing a route
- Discuss how routers are fault-tolerant because of redundancy
- Explain the packet process and how protocols (TCP/IP and HTTP) are vital to the exchange of information on the Internet
- Analyze the different ways that the Internet impacts their lives by learning about how the Internet contributes to collaboration, communication, etc
- Evaluate whether the Internet has a more positive or negative effect on their community by citing examples
- Explain what the digital divide is and articulate their own opinions related to it

Vocabulary & Learning Experiences

Essential Academic Vocabulary

Internet, Protocol, Citizen Science, Data, Number System, Decimal Number System, Binary Number System, Hexadecimal Number System, Bit, ASCII, RGB Encoding, Pixel Image, Pixel, RGB Color Encoding, Networks, Fiber Optic Cables, Bitrate, Bandwidth, Latency, Internet Protocol (IP), Domain Name System

(DNS), Routing, Redundancy, Packets, HTTP

Planned Learning Experiences

Project: The Effects of the Internet

Students choose an innovation that was enabled by the Internet and explore the effects of this innovation. Students will produce a computational artifact (visualization, a graphic, a video, a program, or an audio recording that you create using a computer) and a written response to several prompts.

Resources

CodeHS
Code.org
Blown to Bits

Assessments

Formative Assessments

Think like a Computer Scientist Journal:

Students complete at least five journal entries based on teacher provided prompts that could include major topics, key points, vocabulary, syntax, and/or flowcharts/programming planning.
Quizzes embedded in CodeHS Modules and Code Review

Summative Assessments

Unit Quizzes (multiple choice only)
Student Choice Unit Project

NJSLS Standards

NJSLS Standards Copied and Pasted as well as linked.

NJSLS Computer Science and Design Thinking

8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.

8.2.12.ED.4: Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.

8.2.12.ITH.1: Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints..
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
8.2.12.EC.3: Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.

Additional NJSLS Standards

NJSLS Standards Copied and Pasted as well as linked.

Interdisciplinary Connections

NJSLS Career Readiness, Life Literacies, and Key Skills

NJSLS Companion Standards Grades 9-12 (Reading & Writing in Science & Technical Subjects)

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task

9.4.12.DC.1: Explain the beneficial and harmful effects that intellectual property laws can have on the creation and sharing of content

9.4.12.DC.3: Evaluate the social and economic implications of privacy in the context of safety, law, or ethics

Modifications/Accommodations

GENERAL CONSIDERATIONS FOR DIVERSE LEARNERS

English Language Learners

- Personal glossary
- Text-to-speech
- Extended time
- Simplified / verbal instructions
- Frequent breaks

[WIDA Can Do Descriptors for Grade 9-12]

[WIDA Essential Actions Handbook]

[FABRIC Paradigm]

[Wall Township ESL Grading Protocol]

*Use WIDA Can Do Descriptors in coordination with Student Language Portraits (SLPs).

Students Receiving Special Education Services

- Small group/One to one
- Additional time
- Review of directions
- Student restates information
- Space for movement or breaks
- Extra visual and verbal cues and prompts
- Preferential seating
- Follow a routine/schedule
- Rest breaks
- Verbal and visual cues regarding directions and staying on task
- Checklists
- Immediate feedback

Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

[Considerations for Special Education Students 6-12]

[National Center on Universal Design for Learning - About UDL]

[UDL Checklist]

[UDL Key Terms]

Advanced Learners

- Use of high level academic vocabulary/texts
- Problem-based learning
- Pre assess to condense curriculum
- Interest-based research
- Authentic problem-solving
- Homogeneous grouping opportunities

[Knowledge and Skill Standards in Gifted Education for All Teachers]

[Pre-K-Grade 12 Gifted Programming Standards]

[Gifted Programming Glossary of Terms]

Students with 504 Plan

Teachers are responsible for implementing designated services and strategies identified on a student’s 504 Plan.

At Risk Learners / Differentiation Strategies

Alternative Assessments

Choice Boards

Games and Tournaments

Group Investigations

Learning Contracts

Leveled Rubrics

Literature Circles

Multiple Texts

Personal Agendas

Homogeneous Grouping

Independent Research & Projects

Multiple Intelligence Options

Project-Based Learning

Varied Supplemental Activities

Varied Journal Prompts

Tiered Activities/Assignments

Tiered Products

Graphic Organizers

Choice of Activities

Mini-Workshops to Reteach or Extend

Think-Pair-Share by readiness or interest

Use of Collaboration of Various Activities

Jigsaw

Think-Tac-Toe

Cubing Activities

Exploration by Interest

Flexible Grouping

Goal-Setting with Students

Homework Options

Open-Ended Activities

Varied Product Choices

Stations/Centers

Work Alone/Together