EXPLORING COMPUTER SCIENCE (802)

DESCRIPTION

Exploring Computer Science is designed to introduce students to the breadth of the field of computer science through an exploration of engaging and accessible topics. Rather than focusing the entire course on learning particular software tools or programming languages, the course is designed to focus the conceptual ideas of computing and help students understand why certain tools or languages might be utilized to solve particular problems. The goal of Exploring Computer Science is to develop in students the computational thinking practices of algorithm development, problem solving and programming within the context of problems that are relevant to the lives of today's students. Students will also be introduced to topics such as interface design, limits of computers and societal and ethical issues.

Total Test Questions: 35   Levels: Grades 9-12   Units of Credit: .50

Prerequisites: None

STANDARDS, OBJECTIVES, AND INDICATORS

STANDARD 1:

◈ **HUMAN AND COMPUTER INTERACTION (SUGGESTED TIME FRAME: 6-8 WEEKS). STUDENTS LEARN THE COMPONENTS AND USES OF A COMPUTER.**

Objective 1: Analyze the characteristics of hardware components including processor, operating system, RAM, ROM, hard drive, and input and output devices. Discuss gigahertz, kilobyte, megabyte, gigabyte and terabyte.

Objective 2: Determine the software applications for which computers can be used including word processing, presentation, and spreadsheets and browsers.

   1. Resource - Exploring Computer Science Curriculum V7 Day 3-4

Objective 3: Use tools to yield requested data for Web searches including: search engines and appropriate keywords.

   2. Resource - Exploring Computer Science Curriculum V7 Day 5-7

Objective 4: Evaluate the results of web searches and the reliability of information found on the Web including authority, purpose, coverage, accuracy, objectivity, currency, and accessibility.

   3. Resource - Exploring Computer Science Curriculum V7 Day 5-7

Objective 5: Computers and tasks they perform

   1. Identify required functions for a device to be classified as a computer (takes input, processing; output; storage)
   2. Identify examples of tasks that can and cannot be accomplished with a computer.
   3. Resource - Exploring Computer Science Curriculum V7 Day 15-16, 17-19

Objective 6: Describe changes technology has made on communication, privacy and social interactions.

    1. Appropriate uses of Social Media

    2. Permanence of online information

    3. Methods of communication appropriate for different situations

    4. Online safety

    5. Resource - Exploring Computer Science Curriculum V7 Day 8-9

STANDARD 2:

    ◈ **PROBLEM SOLVING (4 WEEKS). THIS UNIT FOCUSES ON DEVELOPING COMPUTATIONAL THINKING SKILLS AND UNDERSTANDING THE CONNECTIONS BETWEEN MATHEMATICS AND COMPUTER SCIENCE.**

Objective 1: Define computational practices (thought processes involved in expressing solutions to problems that can be carried out by a computer)

    1. Role of communication and collaboration in problem solving (computational thinking)
    2. Designing and implementing creative solutions
      a. Persevering and troubleshooting- break down the problem
        Resource - Exploring Computer Science Curriculum V7 page 12

Objective 2: Solve a problem by applying appropriate problem solving techniques (1:Understand the Problem, 2:Plan the Solution, 3:Carry out the Plan, 4:Review and Discuss your Solution)

    1. Resource - Exploring Computer Science Curriculum V7 Day 3, 4-6, 7-9

Objective 3: Define algorithm (a set of clearly defined, logical steps to solve a problem.)

    1. Resource - Exploring Computer Science Curriculum V7 Day 3, 4-6, 7-9

Objective 4: Create algorithms to solve a problem.

    1. Define and compare Sorting algorithms (include selection sort, quicksort)
    2. Resource - Exploring Computer Science Curriculum V7 Day 3, 4-6, 7-9

    3. Create and use visual artifacts to solve a problem (diagram, chart, graph, table, etc.)

    4. Use an algorithm to solve a minimum spanning tree

    5. Give a real-world application of a minimum spanning tree (package delivery routes, networks, airlines, pipes, electrical grids)

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Objective 5: Explain why binary numbers are used in computer science

1. Count in binary from 0-31
2. Understand the binary system or pattern for counting up to 8 digits.
3. Explain when a binary search would be more efficient than a linear search
4. Resource - Exploring Computer Science Curriculum V7 Day 10-12

Flippy Do - https://drive.google.com/file/d/0B6iNirqJ5EuVVTlla0RpR2Rla2s/view

STANDARD 3:

◈ **INTRODUCTION TO PROGRAMMING (6 WEEKS). STUDENTS ARE INTRODUCED TO SOME BASIC PROGRAMMING ISSUES ASSOCIATED WITH CODE DESIGN AND DEVELOPMENT.**

Objective 1: Create programs that correspond to a set of specifications including: create dialogue between two sprites, more sprites with accuracy, broadcast a message and receive the broadcast, respond to different events.

1. Design (storyboard) a program
2. Resource – Exploring Computer Science Curriculum V7 page 136
3. Know the Scratch environment including sprites, scree/stage size and the following block categories.
   a. Events (green flag, sprite clicked, key pressed, broadcasting)
   b. Motion (move, turn, go to, glide)
   c. Looks (say/think, show/hide, switch costume, change size)
   d. Control (loops, conditions, wait)
   e. Operators/Math (variables, randomness)
4. Resource – Exploring Computer Science Curriculum V7 page D5-6 (139)
5. Test – troubleshoot, locate and correct errors in a program.
6. Execute – run final working program

Objective 2: Explain the term iteration (repeating something multiple times) and give an example of iteration in programming – Exploring Computer Science Curriculum V7 page 5-6

Objective 3: Analyze and explain how a particular program functions.

Objective 4: Discuss the ethical responsibility to society when creating apps or programs – including the following: improve the world around you, efficiency-making things easier, viruses, potential liability for misuse, potential security issues.

STANDARD 4:

◆ **(OPTIONAL) – COMPUTING AND DATE ANALYSIS. STUDENTS EXPLORE HOW COMPUTING HAS FACILITATED NEW METHODS OF MANAGING AND INTERPRETING DATA.**

Objective 1:   Students will use computers to translate, process and visualize data in order to find patterns and test hypotheses.

1. Describe the features of appropriate data sets for specific problems. Use computers to find patterns in data and test hypotheses about data. Justify conclusions drawn from data analysis.

Objective 2:   Students will work with a variety of large data sets that illustrate how widespread access to data and information facilitates identification of problems.

1. Apply a variety of analysis techniques to large data sets.

2. Compare different analysis techniques and discuss the tradeoffs among them.

Objective 3:   Students will collect and generate their own data related to local community issues and discuss appropriate methods for data collection and aggregation of data necessary to support making a case of facilitating a discovery.