Course Title – Computer Programming I

Implement start year – 2014-2015

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Unit #5, topic - Arrays

Students will be able to independently use their learning to efficiently store, and modify data in appropriate structures.

Stage 1 – Desired Results

Established Goals

2009 NJCCC Standard(s), Strand(s)/CPI #
(http://www.nj.gov/education/cccs/2009/final.htm)

Common Core Curriculum Standards for Math and English
(http://www.corestandards.org/)

NJ World Class Standards
Content Area: 21st Century Life and Careers
(http://www.state.nj.us/education/cccs/standards/9/9-4-K.htm)

9.4.12.K.66 Employ information management techniques and strategies to assist in decision-making

9.4.12.K.(3).8 Participate in a user-focused design and development process to produce Web-based and digital communication solution

9.4.12.K.(3).13 Test a digital communication product to evaluate its functionality

9.4.12.K.(4).1 Identify and analyze customer software needs and requirements to guide programming and software development

9.4.12.K.(4).2 Create and use information technology strategies and projects plans when solving specific problems to deliver a product that

21st Century Themes

(www.21stcenturyskills.org)

☒ Global Awareness
☐ Financial, Economic, Business and Entrepreneurial Literacy
☐ Civic Literacy
☐ Health Literacy
☐ Environmental Literacy

21st Century Skills

Learning and Innovation Skills:
☒ Creativity and Innovation
☒ Critical Thinking and Problem Solving
☒ Communication and Collaboration

Information, Media and Technology Skills:
☐ Information Literacy
☐ Media Literacy
☐ ICT (Information, Communications and Technology) Literacy

Life and Career Skills:
☒ Flexibility and Adaptability
☒ Initiative and Self-Direction
☐ Social and Cross-Cultural Skills
☒ Productivity and Accountability

meets customer specifications

9.4.12.K.(4).3 Identify and analyze system and software requirements to ensure maximum operating efficiency

9.4.12.K.(4).4 Demonstrate the effective use of software development tools to develop software applications

9.4.12.K.(4).5 Use the software development process to design a software and deliver it to the customer

9.4.12.(4).6 Produce a computer application, in code, to demonstrate proficiency in developing an application using the appropriate programming language

9.4.12.K.(4).7 Implement software testing procedures to ensure quality products

9.4.12.K.(4).8 Perform quality assurance tasks to produce quality products.

9.4.12.K.(4).9 Perform maintenance and customer support functions to maintain software applications.

□ Leadership and Responsibility

Enduring Understandings:

Students will understand that . . .

EU 1

- Date can be arranged using a variety of techniques

EU 2

- data structures allow for large amounts of data to be manipulated efficiently.

EU 3

- Data structures allow large amounts of data to be placed into an easily accessible format

Essential Questions:

EU 1

- How can data be arranged?
- Which structure is appropriate given a data set?

EU 2

- How can a data structure be manipulated?
- How can data be arranged in a structure?
- What are the benefits of being able to manipulate large amounts of data

EU 3

- How do data structures simplify accessing data?
- How are searches efficiency effected by the arrangement of data?

Knowledge:
Students will know . . .

EU 1

- the differences between static and dynamic arrays
- Arrays can vary in their size and dimension
- Arrays commonly contain elements of the same type
- The array indices begin at zero
- An error will occur if a program attempts to save information outside the bounds of the array

EU 2

- there are different ways to sort an array
- different sorting techniques should be used with different data sets
- The efficiency of each sorting technique is dependent on the original data arrangement

EU 3

- searching sorted data improves the efficiency of the search
- loops are used in a search

Skills:
Students will be able to . . .

EU 1

- Declare a static array of each data type
- Declare a dynamic array and re-allocate its memory space
- Populate arrays using a loop
- Recognize and repair an error message.

EU 2

- Sort an array using the appropriate technique
- Rearrange the order precedence of a sort
- Utilize loops to sort and display data from a data structure

EU 3

- access data from a data structure
- Find the location of a specific piece of data from within the structure
- Utilize loops to find and return a specific piece of data from within the structure

Stage 2 – Assessment Evidence

Recommended Performance Tasks: *Each unit must have at least 1 Performance Task. Each EU must be addressed in a performance task. Consider the GRASPS form.*

Scoring Rubric

- Variables are of appropriate type and scope with meaningful and descriptive modifiers
- Form has a professional look and layout
- Code is well documented including a header
- All files are named and uploaded properly
- An input object for individual name, team and score
- A dynamic array to store each individual's name and score
- A dynamic array to store each team's score
- Team score must be sorted using any of the sorting techniques discussed
- A list box to display each team's name, team members and combined score

Other Recommended Evidence: *Tests, Quizzes, Prompts, Self-assessment, Observations, Dialogues, etc.*

- Flow charts including program flow and looping processes
- Pseudo code: a handwritten version of the program where the code is not written in full but rather an idea of the program flow is hashed out on paper
- Algorithms: Written code of the mathematical process that will allow data to be put into an array and sorted. The mathematical process of searching for data using different techniques.
- Test/quizzes
- Class discussion
- Program maintenance. Revising a program to adjust to the needs of different data types and number of data members

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Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: *Consider the WHERETO elements. Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.*

Develop a static array that stores a person's first and last name separately (A,M)

- Develop a dynamic array that scores a student's test scores for each marking period (A,M)
- Sort, using a bubble sort, an array that has been pre-populated string data alphabetically (A,T)
- Sort, using a selection sort, an array that will be populated with numerical data (M,T)

The following is the suggested sequence of learning activities and number of days for Computer Programming I class
Approximately 40 days

- Loop Structures: Loop Variables
- Loop Structures: For Loops and their uses
- Loop Structures: DO (While) Loops and their uses
- Loop Decisions: Choosing the appropriate loop for a given situation
- Arrays: Declaration, Size and indices
- Arrays: One-Dimensional
- Arrays: Static Population
- Arrays: Dynamic Population
- Arrays: Two-Dimensional Arrays
- Passing arrays to other methods
- Sorting Techniques: Moving data into an order
- Sorting Techniques: Changing the order of a sort
- Searches: Linear Searching
- Searches: Binary Searching
- Comparison of Sorting and Searching Techniques

Vocabulary

- Incrimination
- Index
- Length method
- Offset
- Data Pointing
- Non-Sequential
- Linear Search
- Binary Search
- Swapping Data
- Temp Variables
- Big O Notation

- Logs
- Bubble Sort
- Shell Sort
- Selection Sort