Course Title – Computer Programming II

Implement start year – 2015-2016

Revision Committee Members, email, extension –
Scot Butler sbutler@lrhsd.org **ext. 8870**
Chris Callinan ccallinan@lrhsd.org **ext. 8364**
Robert Kibler rkibler@lrhsd.org **ext. 8583**

Unit # 5 - Searching and Sorting

Transfer Goal –

Students will be able to independently use their learning to use standard algorithms to search and sort various data 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 Learning 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-friendly design and development process Web-based and digital communication solution
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 meets customer specifications

21st Century Themes
(www.21stcenturyskills.org)

_X_ Global Awareness
___Financial, Economic, Business and Entrepreneurial Literacy
___Civic Literacy
___Health Literacy
___Environmental Literacy

21st Century Skills

Learning and Innovation Skills:
_X_Creativity and Innovation
_X_Critical Thinking and Problem Solving
__Communication and Collaboration

Information, Media and Technology Skills:
_X_Information Literacy
___Media Literacy
_X_ICT (Information, Communications and Technology) Literacy

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 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.K.(4).6 Produce a computer application, in code, to demonstrate proficiency in developing an application using the appropriate programming language	*Life and Career Skills:* _X_Flexibility and Adaptability ___Initiative and Self-Direction ___Social and Cross-Cultural Skills _X_Productivity and Accountability ___Leadership and Responsibility
Enduring Understandings: *Students will understand that . . .* EU 1 • different data structures offer different advantages. EU 2 • there are basic operations associated to different data structures. EU 3 • the sorting of data allows for effective searches. EU 4 • different sorting algorithms are more effective depending on the data.	**Essential Questions:** EU 1 • What are the advantages or disadvantages to the different data structures? EU 2 • How can data be accessed, deleted or inserted in trees? EU 3 • How can a set of data be searched economically? EU 4 • When will each of the basic sorts be more practical?
Knowledge: *Students will know . . .* *EU 1* • the components of a binary tree. *EU 2* • the basic traversals of a binary tree.	**Skills:** *Students will be able to . . .* *EU 1* • represent data in a binary tree. EU 2 • perform the basic traversal of a binary tree on paper. • explain the process involved in inserting or deleting a node into a

• the insertion and deletion algorithms for a binary tree. EU 3 • the difference between a sequential search and a binary search. EU 4 • the different types of sorts and what types of data sets lend themselves to each.	binary tree. EU 3 • write a program to perform a sequential search while counting the number of comparisons. • write a program to perform a binary search while counting the number of comparisons. EU 4 • write code to perform selection sort. • write code to perform insertion sort. • write code to perform merge sort. • explain which sort is preferred when.

Stage 2 – Assessment Evidence

Other Recommended Evidence:

The following is the suggested sequence of learning activities and number of days:
(Approximately 27 days)

- Flow charts including program flow, evaluations of conditions and the looping process.
- Pseudo code: a handwritten version of the program where the code is not written in full but rather the process that a program will follow that is developed on paper.
- Algorithms: Written code of the mathematical process that will allow data to be put into an array, sorted and then have information be retrieved from using different techniques.
- Quizzes on traversals, sorts and searching algorithms.
- Unit test
- Class discussion

Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections:

- Using the different sorting algorithms sort the class by height, age, and randomly assigned values. (A, M, T)
- Create a digital representation of binary trees performing comparing the three traversals. (A, M, T)
- Develop algorithms for the three basic sorts selection, insertion, and merge sort. (A, M, T)
- Calculate the number of comparisons and moves for various searches and sorts of a tree of size n. (A, M, T)
- Explain what types of data sets would be sorted faster by the different algorithms.(A,M)

Vocabulary

- Tree
- Binary Tree
- Node
- Leaf
- Root
- Subtree
- Sequential Search
- Binary Search
- Selection Sort
- Insertion Sort
- Merge Sort
- Big O Notation