

Summit Public Schools
Summit, New Jersey
Grade Level / Content Area: Mathematics
Length of Course: ½ Academic Year
Curriculum: Introduction to Computer Programming
Updated: Spring 2019

Developed By
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Course Description: This elective course serves as an introduction to computer programming for students with no prior programming experience. Over the course of the semester students will explore a number of core programming concepts in the Alice program. Students who complete this course with a B- or higher will be prepared to take the Intro to Java Programming course.

Topics that will be taught include basic variables (int and boolean), if/else statements, while loops, basic programming structure, 3D animation and basic game design techniques. Students will also learn basic problem-solving techniques. Projects will be completed in individual and group settings.

Anticipated Timetable for Intro to Computer Programming

QUARTER 1

Unit 1 – Custom Methods and Animations

Topic	Time Frame
Class Introduction	1
Overview of Alice Program	1
Basics of Coding	2
How to Make a Custom Method and Animation	1
PROJECT #1	3
Total	8

Unit 2 – Creating and Organizing a Story

Topic	Time Frame
Using events	1
Bottom up programming	1
Organizing larger projects	2
PROJECT #2	5
Total	9

Unit 3 – Parameters

Topic	Time Frame
Introduction to parameters	1
How to use parameters	1
Parameter practice	2
One period programming activity	1
PROJECT #3	5
Total	10

Unit 4 – Using the Camera

Topic	Time Frame
Introduction to camera	1
How to use dummy objects	1
Integrating the camera and dummy objects	2
Camera Tricks	1
PROJECT #4	6
Total	11

QUARTER 2

Unit 5 – Introduction to Variables

Topic	Time Frame
Introduction to variables	1
Variables compared to Parameters	2
If statements	1
While loops	1
Object variables compared to method variables	2
Putting it all together	1
PROJECT #5	6
Total	14

Unit 6 – Advanced Parameters and Variables

Topic	Time Frame
How to reuse old code	2
PROJECT #6	5
Total	7

Unit 7 – Introduction to User Interaction

Topic	Time Frame
Mouse clicking event	2
Using variables to modify events	2
Creating games	2
One period practice activity	1
PROJECT #7	6

Total	13
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Unit 8 – **Advanced User Interaction**

Topic	Time Frame
Remaining Alice events	3
Integrating events with previous topics	2
Variables, parameters, and basic collision detection	2
Putting it all together	2
PROJECT #8	7
Total	16

Unit 9 – **Introduction to Arrays**

Topic	Time Frame
Making lists	2
For all in order and for all together	2
Collision detection – walls	1
Collision detection – points, damage, other interactions	2
PROJECT #9	7
Total	14

Unit 1: Custom Methods and Animations

Standard	
<p>Big Ideas: <i>Course Objectives / Content Statement(s)</i></p> <ul style="list-style-type: none"> ● Students will learn about the 5 areas of the Alice program ● Students will learn how to create their own custom animations with the move, turn and roll commands. ● Students will learn how to create custom methods. ● Students will learn the “do together” and “do in order” commands. ● Students will learn the importance of creating custom methods. 	
Essential Questions	Enduring Understandings
<i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	<i>What will students understand about the big ideas?</i>
<ul style="list-style-type: none"> ● How do I select only part of an object? ● When do I need a ‘do in order’ vs a ‘do together’ ● What are the benefits of creating my own methods? 	<p>Students will understand that...</p> <ul style="list-style-type: none"> ● Each animation should be placed in its own method. ● Animations should begin and end with the object in the same relative position for easy looping.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
<p>Students will:</p> <p>Be able to create basic animations</p> <p>Remember to code in the correct locations</p> <p> </p> <p> </p> <p> </p>	<p>Instructional Focus (1 week):</p> <ul style="list-style-type: none"> ● Project 1 – Custom Methods – Students will select an object of their choosing and create a custom animation for it. Objects must have at least 10 individually controllable components. <p>Instructional Strategies:</p> <ul style="list-style-type: none"> ● Individual work ● In-class programming time with assistance from teacher <p>Technology Integration</p> <ul style="list-style-type: none"> ● Alice program

Unit 2: Creating and Organizing a Story

Standard	
<p>Big Ideas: <i>Course Objectives / Content Statement(s)</i></p> <ul style="list-style-type: none"> ● Students will learn how to determine when a custom method needs to be made. ● Students will learn how to create “world” methods along with its similarities and differences between object methods. ● Students will learn how to properly put together a single scene with multiple methods. ● Students will learn the golden rule of programming 	
Essential Questions	Enduring Understandings
<i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	<i>What will students understand about the big ideas?</i>
<ul style="list-style-type: none"> ● What is the difference between an object method and a world method? ● How can I tell if something should be a method? ● Why can't I refer to an object in another object's code? ● When should I split a method in two? 	<p>Students will understand that...</p> <ul style="list-style-type: none"> ● They cannot create object methods that include multiple objects. ● They should start with individual methods and move on to world methods. ● The first step of programming is to identify the individual methods that will be needed.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
<p>Students will:</p> <p>Be able to make object interact in world methods.</p> <p>Create custom animations for each object.</p> <p>To use animations that make objects interact.</p> <p>Identify which animations are needed to program a scene.</p>	<p>Instructional Focus (1 week):</p> <ul style="list-style-type: none"> ● Project 2 – Story Board – Students will all code the same story with the same 4 animations. The animations will be voted on by the class. After creating these animations they can tell whichever story they want as long as it includes these animations. <p>Instructional Strategies:</p> <ul style="list-style-type: none"> ● Individual work with help from peers ● In-class programming time with assistance from teacher ● At home programming time <p>Technology Integration</p> <ul style="list-style-type: none"> ● Alice program <p>Global Perspectives</p> <p>Students will learn to emphasize creativity in their program design. We will examine how</p>

	<p>students approach and solve similar tasks in unique ways. We will discuss what makes an “elegant” solution compared to a practical or functional solution. Students will take other student’s projects and interpret their code.</p>
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Unit 3: Parameters

Standard	
<p>Big Ideas: <i>Course Objectives / Content Statement(s)</i></p> <ul style="list-style-type: none"> ● Students will learn how to add parameters to methods and use them to customize methods. ● Students will learn about the “purple tiles” and how to use them to make object move a certain set distance. ● Students will learn how to use algebra to create flexible and functional methods. 	
Essential Questions <i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	Enduring Understandings <i>What will students understand about the big ideas?</i>
<ul style="list-style-type: none"> ● How can I make an object do something when I don't know the exact values for the command? ● How do parameters help generalize my code? ● How do I use purple tiles to complete calculations that I cannot do by hand? 	<p>Students will understand that...</p> <ul style="list-style-type: none"> ● Parameters extend the functionality of a method so that it can be used in a variety of situations. ● Purple tiles allow the computer to do hard or complex calculations. ● Parameters and purple tiles may be combined to create even more powerful calculations
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
<p>Students will:</p> <p>Be able to know when they need to create methods without being instructed to do so.</p> <p>Identify which components of a method should be integrated with parameters.</p> <p>Be able to quickly create basic animations</p>	<p>Instructional Focus (1 week):</p> <ul style="list-style-type: none"> ● Project 3 – Precision Story – Students will create a story with two characters whose positions will be placed randomly in the world. These characters must be able to meet each other and have an animated interaction. Part of the testing of the project will be placing the objects in different locations. <p>Instructional Strategies:</p> <ul style="list-style-type: none"> ● Individual work with help from peers ● In-class programming time with assistance from teacher ● At home programming time <p>Technology Integration</p> <ul style="list-style-type: none"> ● Alice program <p>Media Literacy Integration</p>

	<p>We will examine “pseudo-code” and how it allows people who code in different languages to interact with each other and work together.</p>
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Unit 4: Use the Camera

Standard	
<p>Big Ideas: <i>Course Objectives / Content Statement(s)</i></p> <ul style="list-style-type: none"> ● Students will learn how to manipulate the camera to create camera angles. ● Students will learn how to create dynamic “action” shots by writing code for the camera. ● Students will learn how to control “invisible” objects like the camera. 	
Essential Questions	Enduring Understandings
<i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	<i>What will students understand about the big ideas?</i>
<ul style="list-style-type: none"> ● How is the camera like an object and how is it not like an object? ● How is the camera and dummy objects linked? 	<p>Students will understand that...</p> <ul style="list-style-type: none"> ● There is more to telling a story than pointing the camera at the object. Angle, lighting and movement can affect how an action is portrayed.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
<p>Students will:</p> <p>Utilize all the previously available tools at maximum effectiveness as demonstrated in their project.</p> <p>Be able to use all the new methods exclusively designed for the camera</p> <p>Be able to use dummy objects to create camera angles</p>	<p>Instructional Focus (2 weeks):</p> <ul style="list-style-type: none"> ● Project 4 – Movie – Students will demonstrate mastery of previous subjects and the camera by making a short movie. All movies must contain an action shot. <p>Instructional Strategies:</p> <ul style="list-style-type: none"> ● Group work/individual work ● In-class programming time with assistance from teacher ● At home programming time <p>Technology Integration</p> <ul style="list-style-type: none"> ● Alice program <p>Media Literacy Integration</p> <p>We will view a variety of famous movies scenes to examine how the camera is situated and how it moves. We will discuss what emotion the scene is conveying.</p>

Unit 5: Introduction to Variables

Standard	
<p>Big Ideas: <i>Course Objectives / Content Statement(s)</i></p> <ul style="list-style-type: none"> ● Students will learn how to create int and boolean variables on objects. ● Students will learn how to use these variables to track actions with if statements and while loops. ● Students will learn how to create random numbers and use them to dictate actions. 	
Essential Questions	Enduring Understandings
<i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	<i>What will students understand about the big ideas?</i>
<ul style="list-style-type: none"> ● What is the purpose of Boolean variables? How can they be used to determine whether an action has occurred? ● When should an int variable be used instead of a Boolean? 	<p>Students will understand that...</p> <ul style="list-style-type: none"> ● A Boolean method must return true or false while an int variable can be any numeric value. ● Variables values are set by the user and changed by the user. They remember their value as long as the code is running. ● It is up to the programmer to track and change the value of a variable. The computer does not “understand” what a variable represents.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
<p>Students will:</p> <p>Be able to integrate camera movements, parameters and methods into their code as needed.</p> <p>Be able to create, track and change variables on objects.</p>	<p>Instructional Focus (2 weeks):</p> <ul style="list-style-type: none"> ● Project 5 – Variables – Students will all code the same project, making a Gorilla put away it’s toys randomly. ● Test 1 – Students will have to demonstrate an understanding of Boolean and int variables. <p>Instructional Strategies:</p> <ul style="list-style-type: none"> ● Group work/individual work ● In-class programming time with assistance from teacher ● At home programming time <p>Technology Integration</p> <ul style="list-style-type: none"> ● Alice program

Global Perspectives

Students will examine how computers randomly generate numbers. A variety of methods will be explored and tested. The idea of random vs. pseudo-random will be discussed.

Unit 6: Advanced Parameters and Variables

Standard	
<p>Big Ideas: <i>Course Objectives / Content Statement(s)</i></p> <ul style="list-style-type: none"> ● Students will learn how to import old code into new projects. ● Students will learn how to fix old code that has been written improperly. ● Students will learn how to integrate parameters, object variables and purple tiles to make powerful statements. 	
Essential Questions	Enduring Understandings
<i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	<i>What will students understand about the big ideas?</i>
<ul style="list-style-type: none"> ● Why can I not refer to an object in another object's code? ● How do I organize coding in a group? 	<p>Students will understand that...</p> <ul style="list-style-type: none"> ● You must agree to standards with your peers before beginning coding to ensure that your code is compatible
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
<p>Students will:</p> <p>Be able to write code that does not break the golden rule.</p> <p>Be able to integrate if statement/while loops, variables and purple tiles.</p>	<p>Instructional Focus (2 weeks):</p> <ul style="list-style-type: none"> ● Project 5 – Wacky Race – Working in groups of 3s, students will each code an individual racer and then integrate their racers into one project and have them race. This will require students to create individual races on their own computer and then group their work together and submit a final project. <p>Instructional Strategies:</p> <ul style="list-style-type: none"> ● Group work/individual work ● In-class programming time with assistance from teacher ● At home programming time <p>Technology Integration</p> <ul style="list-style-type: none"> ● Alice <p>Media Literacy Integration</p> <p>We will examine Java code from a more advanced project in order to see what parts of the project they can understand. We will attempt to demonstrate how, just like with a spoken language, you do not need to understand everything in order to figure out what is going on.</p>

Unit 7: Introduction to User Interaction

Standard	
<p>Big Ideas: <i>Course Objectives / Content Statement(s)</i></p> <ul style="list-style-type: none"> ● Students will learn how to integration mouse clicking into their projects to create games. ● Students will learn how to use object variables to store mouse clicking information and use if statements on these variables. ● Students will learn how to structure a large project to ensure they stay organized. 	
Essential Questions	Enduring Understandings
<i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	<i>What will students understand about the big ideas?</i>
<ul style="list-style-type: none"> ● How do I break down a large problem into smaller, more manageable chunks? ● How should I organize a large project? ● How do I determine whether to use object variables vs. Boolean vs. int. 	<p>Students will understand that...</p> <ul style="list-style-type: none"> ● Code must be written so that anyone in the class could read another other student's code. ● Boolean variables must be used to track whether or not something has occurred. ● The computer cannot understand what a variable represents. It simply examines the value of the variable.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
<p>Students will:</p> <p>Be able to organize and compartmentalize their code appropriately.</p>	<p>Instructional Focus (2 weeks):</p> <ul style="list-style-type: none"> ● Project 7 – Mouse Clicking Game – Students will create a game utilizing the mouse clicking event. They will create a rough draft, play test each other's games, provide feedback and finally use that feedback to complete the game. ● Test 2 – Students will demonstrate understanding of mouse clicking and object/boolean variables. <p>Instructional Strategies:</p> <ul style="list-style-type: none"> ● Group work/individual work ● In-class programming time with assistance from teacher ● At home programming time ● Play testing each other's games. <p>Technology Integration</p>

- Alice Program

Global Perspectives

We will examine the purpose and goal of play testing a game's rough draft. We will discuss how to evaluate and integrate feedback, both positive and negative, into a game.

Unit 8: Advanced User Interaction

Standard	
<p>Big Ideas: <i>Course Objectives / Content Statement(s)</i></p> <ul style="list-style-type: none"> ● Students will learn all remaining events in Alice for user interaction except for “While a key is pressed” ● Students will learn when to use each of these events to achieve the appropriate action in their game. ● Students will learn how to create a numbered counter in the form of a timer, score counter or other display. 	
Essential Questions <i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	Enduring Understandings <i>What will students understand about the big ideas?</i>
<ul style="list-style-type: none"> ● How can I tell which event will accomplish the task at hand? How can I tell if there is a better solution? ● How do I integrate previously learned programming techniques into this game? 	<p>Students will understand that...</p> <ul style="list-style-type: none"> ● They must outline their project first into order to ensure they do not lose track of what to code and what to work on. ● They will need to integrate all their previously learned skills to create a fully fleshed out game.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
<p>Students will:</p> <ul style="list-style-type: none"> - Be able to forward integrate all the tools they learned coding with Wombats into traditional coding. - Be able to identify the proper events for specific situations. - Be able to fully integrate if statements, while loops all variables and purple tiles. 	<p>Instructional Focus (2 weeks):</p> <ul style="list-style-type: none"> ● Project 8 – Game – Students will create a game that utilizes at least 2 of the newly learned events and includes some sort of numbered counter. Just as with the last project, they will play test each other’s games. ● Test 3 – Students will demonstrate mastery of concepts of user interaction. <p>Instructional Strategies:</p> <ul style="list-style-type: none"> ● Individual work ● In-class programming time with assistance from teacher ● At home programming time ● Play testing each other’s games. <p>Technology Integration</p> <ul style="list-style-type: none"> ● Alice Program

Unit 9: Introduction to Arrays

Standard	
<p>Big Ideas: <i>Course Objectives / Content Statement(s)</i></p> <ul style="list-style-type: none"> ● Students will learn how to use the “while a key is pressed” event. ● Students will learn how to create collision detection. ● Students will learn how to create lists of objects and use the “for all together” and “for all in order” tiles. ● Students will learn how to create lists (arrays) of objects and how to use a basic loop to process all the elements in the array. 	
Essential Questions	Enduring Understandings
<i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	<i>What will students understand about the big ideas?</i>
<ul style="list-style-type: none"> ● How do I avoid overusing my computer’s memory? ● What types of actions can occur when I collide with an object? 	<p>Students will understand that...</p> <ul style="list-style-type: none"> ● They must be careful not to overtax the computer and cause slow down or crashing. ● They must be careful with how they write code to ensure it is efficient.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
<p>Students will:</p> <ul style="list-style-type: none"> - Be able to create lists of objects and write code that relates to all of them. - Utilize all the events in the Alice Program. - Understand how a loop and an array can cut down on repetitive code. - Be able to compare and contrast a while loop with a for all together loop. 	<p>Instructional Focus (2 weeks):</p> <ul style="list-style-type: none"> ● Project 9 – Final Project – Students will write one final project utilizing all their previously learned skills. The game must include some form of collision detection and a fully controlled character. <p>Instructional Strategies:</p> <ul style="list-style-type: none"> ● Individual work ● In-class programming time with assistance from teacher ● At home programming time ● Play testing each other’s games. <p>Technology Integration</p> <ul style="list-style-type: none"> ● Alice Program <p>Media Literacy Integration</p> <p>Students will briefly examine a simple Java project and see how much they can read and figure out just based on their Alice work.</p>

	They will execute a simple Java program as a lead in to the next course.
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