Computer Science Integration Lesson Plan

Submitted by:	Brooke George
Assignment:	Algorithms with Origami
Grade Level:	3-5
Subject:	Computer Science
CS Standard Domain:	Algorithms and Programming, Impacts of Computing
CS Standard Practices:	Collaborating around computing, recognizing and defining computational problems, Communicating about computing
NGSS, Common Core, ISTE, etc... Standards:	CS: 5.AP.A.01, 5.AP.M.01, 5.AP.M.02, 5.AP.PD.01, 5.AP.PD.03, 5.AP.PD.04, 5.AP.PD.05, 5.IC.SI.02. ISTE: 4.A, 4.C, 4.D, 5.A, 5.C, 5.D, 6.D, 7.B, 7.C, ELA: RL.5.5, RI.5.3, RI.5.9, SL.5.6
Reading Connection:	Possible reading connection can be made by reading one or more of the following books: ● "Sadako and the thousand paper cranes", by Eleanor Coerr ● "The Paper Crane" by Molly Bang ● "Tree of Cranes" by Allen Say ● "Little Oh" by Laura Krauss Melmed ● "The Strange Case of Origami Yoda" by Tom Angleberger (series) ●
Technology/ Equipment/ Resources:	● pre cut paper squares ● directions for different origami depending on skill level ● https://docs.google.com/document/d/1sWa2XeyvKr9iLgx8KM-quway32_JpQv50McDdgh2iuU/edit# ●
Vocabulary:	algorithms, sequencing, decomposing, debug

Learning Target	Students will understand why step by step instructions are important
Pre test Questions:	1. What is an algorithm? 2. How do algorithms help us? 3. Why do computers need algorithms?
Objectives	SWBAT... 1. Complete a task using an algorithm 2. Understand what algorithms are 3. Understand when we use algorithms in daily tasks

Catch	See, Hear, Touch, Taste, or Do/Show Show an origami completed and ask how this was made. or Show a computer doing something: How did that computer know how to do that? What would we need to do to get the computer to do what I want it to? or When I make a PBJ sandwich I do it in the same order every time. Why do you think I do that? If I had someone else make me a sandwich how would they know how I like my sandwiches made?
Activity	1. **Computers use algorithms to tell them what they should do.** In order for the computer to receive an algorithm someone has to write the algorithm or code. Today we are going to learn what an algorithm is and how important they are to a computer. 2. **Define the following vocabulary and talk about what they are and how we use them.** a. **Sequence:** A sequence is when you put the instructions in the order they need to be in to accomplish the task. Chances are, your origami instructions are b. **Algorithms:** Algorithms are basically just the sequence of steps you take to accomplish a task. Origami is laid out so nicely already, all you have to do is follow each step. This is an algorithm. 3. **So we need to understand what an algorithm is in order to be ready to make an algorithm. We need algorithms to teach a computer what it needs to do to give you an end result.** 4. Read a book to bring a connection into reading. Help start their interest in origami. (Choose from the list above according to your students intereset level.) a. In the book we read did you see any algorithms being used? b. yes, steps they followed to make the origami 5. **Origami Unplugged Coding Activity:** Today we are going to see how we can find an algorithm in many different tasks. Lets look at how using origami can be an algorithm. a. To start: In this origami activity, your partner will teach YOU how to make a simple origami creation by giving you specific instructions to complete the task. The catch is that you will be sitting back to back so your partner will have to be very specific

	and detailed in their instructions so that you can create the origami correctly! b. It is very important to explain the instructions step-by-step, completing a task the same way a computer would. Just like in this activity, computers don't have an idea of what the final program is supposed to look like. You need very detailed and accurate instructions in order to complete the task properly. 6. **Step By Step Instructions:** a. They KEY to this algorithm activity is that your origami 'coder' needs to explain the algorithm WITHOUT you looking at the visual instructions. i. Sit back to back with your partner. ii. Each person starts with an unfolded square piece of paper. iii. Have your partner teach you how to make this simple origami creation by explaining the instructions to you as they create it too. They will use the origami instruction sheet to create the origami but you will not be able to look at the instructions when they are explaining it! iv. Compare creations! When you are done building your creation, turn around and see if you got it right! b. By not being able to SHOW you the instructions, your partner or 'origami coder' will learn just how challenging algorithms are for computers! Computers don't have eyes to see. They need to be given VERY SPECIFIC and exact instructions with lots of detail. If computers aren't given the correct instructions, the final outcome can turn out really silly! c. If your partner gives you some instructions that aren't quite right, follow through with them in your origami design. Then when you compare at the end, you might note some pretty funny errors! That's ok, errors are part of programming. 7. Now we just have to **debug** our errors. Figure out where we went wrong and how we can correct it better for the future. 8. The basics of any coding language involve the concepts of algorithms, sequences, decomposition, and being able to debug a problem that might come up anytime you write or complete an algorithm.
Review	1. What is an algorithm? 2. Why does a computer need an algorithm? 3. What do we do if we follow the algorithm but it doesn't come out correctly?

Assessments	Formative: You can give a short quiz on if students know the difference between sequencing and algorithms. You can also ask why computers need algorithms Summative: ● Did students' origami come out correctly? ● Did they communicate with their peers?
Post test Question	4. What is an algorithm? 5. How do algorithms help us? 6. Why do computers need algorithms?