Computer Science
Lesson Plan
Michelle Best

Grade: 4-6

Essential Question:
What measures can we implement to write successful code?

Purpose: This activity will help students share ideas and analyze the best way to write code. It is also helpful to have another pair of eyes in the process.

Learning Objective - SWBAT:
-Use pair programming to strengthen listening and visual skills.
-Write algorithms for real-life programs.
-Identify and address errors (non-explicit instructions) in algorithms.

NYS K-12 Computer Science & Digital Literacy Standards:
Algorithm and Programming –

- *4-6.CT.10 Describe the steps taken and choices made to design and develop a solution using an iterative design process*
- *4-6.CT.4 Decompose a problem into smaller named tasks, some of which can themselves be decomposed into smaller steps.*

Materials:
1. Unplugged materials: maze, pencil/pen, drawing & lined paper
2. Block Code program

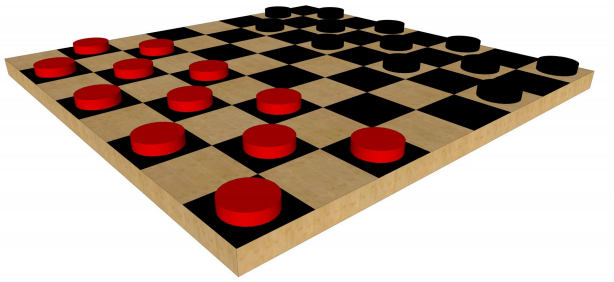
Motivation:
Teacher will ask students to work in pairs. In the pairs, one student will be the hands to build the lego figure and follow the other student's instructions while the other is providing instruction. After a few moments, students will switch and the builder will now give instructions from where the other student left off.
After both students had a chance to operate in both roles, Teacher will ask students to share out the answer to the questions:
What was challenging about this task? What was successful? How can pairing together support?

Development (10 min):

- Teacher will review the purpose of the motivation and learning objective and then define pair programming: a technique in which two programmers work together at a station to code. One is the driver, coding/ doing action steps. The other is the navigator providing instruction. Teacher will share the benefits of this strategy via chart.

GRADUAL RELEASE OF RESPONSIBILITY:

"I" Section



- Teacher will display the game, Checkers, on the SmartBoard and review the rules of the game. Teacher will then call on three volunteers: one volunteer is Teacher's partner; the other volunteers are a team. Teacher will assign roles. As the driver, Teacher will give direction to her partner and the partner will execute the task. Teacher will assess the board and say:
  -If I make this move, my opponent will win this play. Therefore, move forward two spaces.
- Teacher will ask the opponent team to make their move, demonstrating the Driver and Navigator movements just as displayed from teacher.
  -If I make this move, I can gain my opponent's chip. Therefore, move left one space.

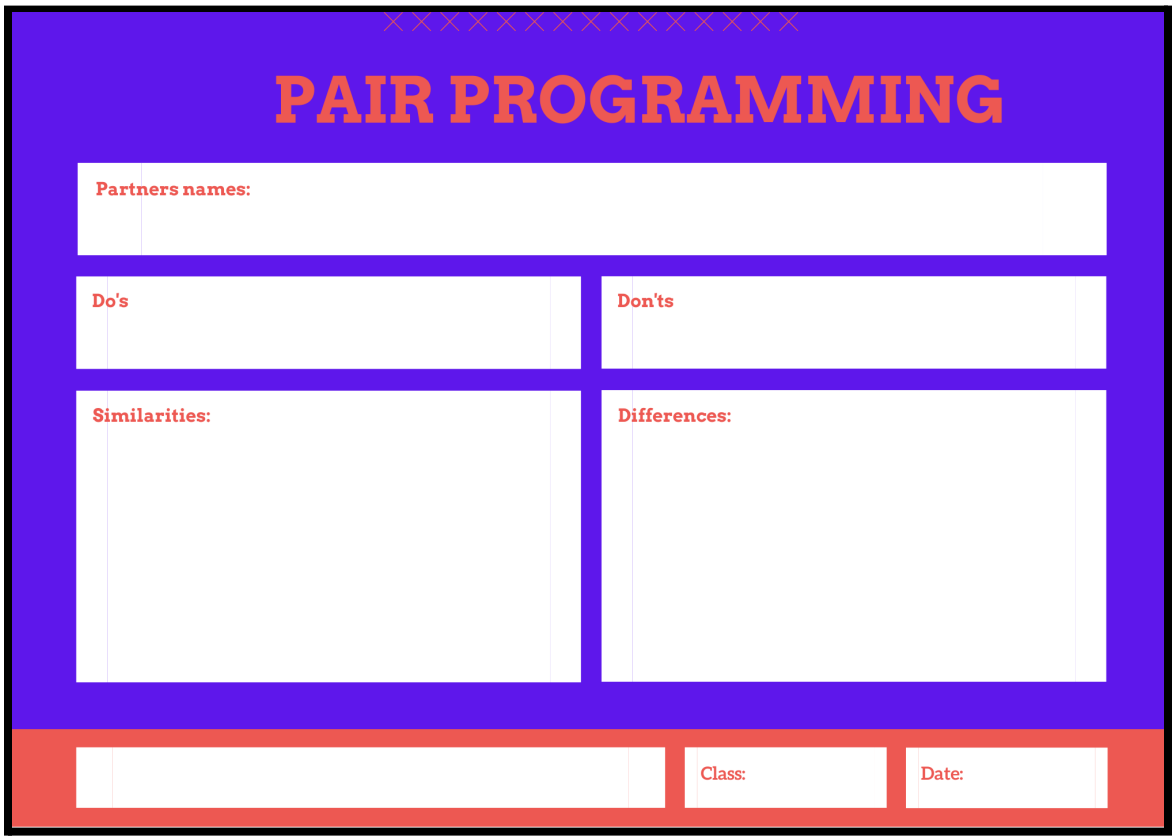
- Teacher will inform the class that even though my partner may have thought there would be a better move to make, as the driver, my partner had to follow instructions.
- Game will repeat four times.
- Teacher will implement the "Think, Pair, Share" strategy to ask: In what ways did you find the pair programming with

Teacher and partner beneficial? Teacher will display this video (https://youtu.be/vgkahOzFH2Q) and then ask students to work with with their pair programmer to jot down the answer to the following questions:

"We" Section

- Teacher will ask students in groups to watch another video (https://youtu.be/q7d_JtyCq1A) and answer questions together in preparation of the pair programming task.
- Questions:

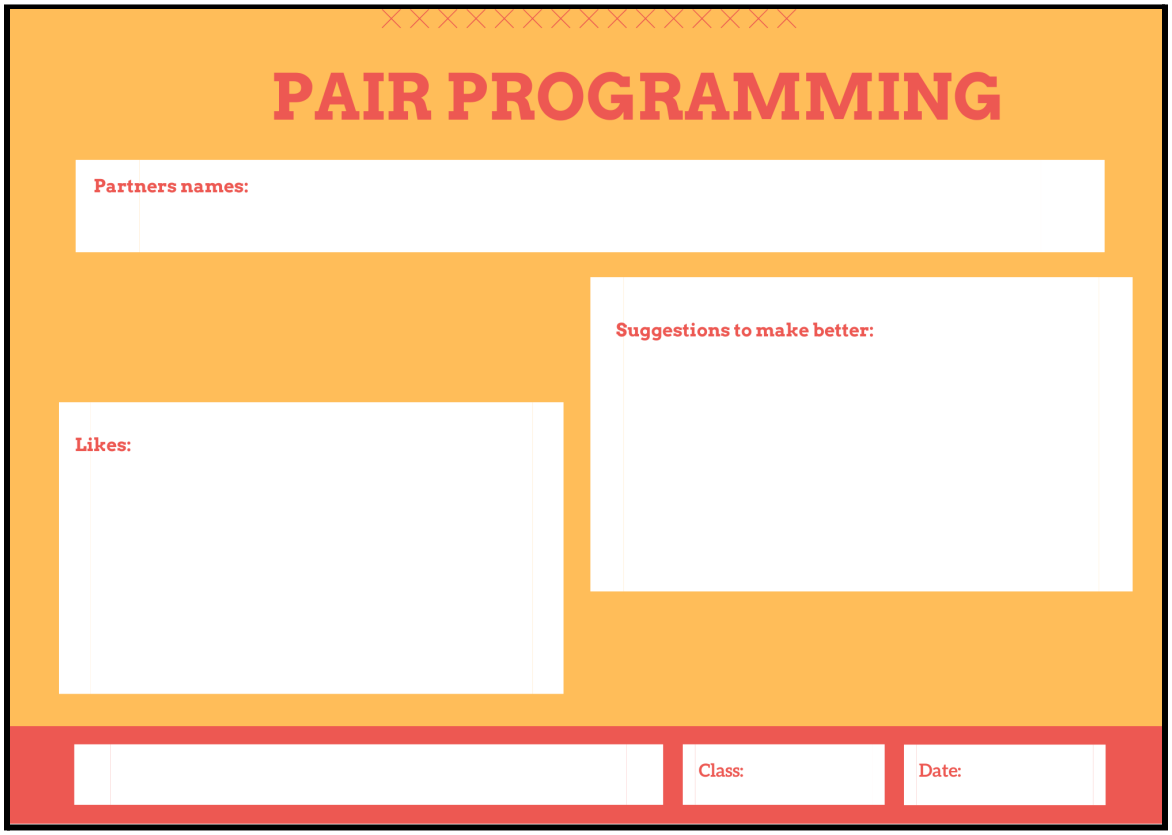
  What are the main jobs for the Driver and the Navigator?
  What should BOTH partners DO?
  What should BOTH partners NOT do?
  Why is pair programming worth doing?



- Teacher informs students that they will play a pair programming game called *Draw What I Say. In this activity,*

each pair will be handed a deck of cards that have drawings on it. The Navigator is required to provide clear instructions to the Driver, the Driver must execute it. After about 30-45 seconds, the pairs switch roles and continue the task until the timer is up. At the end, the students will assess how clearly their images reflected the instructional task.

- Have students "Turn & Talk" to answer on document below: *What strategies should we implement to make a more effective pair programming partnership?* Teacher will jot ideas and display them for all groups to analyze and implement.



Medial Summary:

Teacher will draw students' attention to the learning objective to review the goal:

-Use pair programming to strengthen listening and visual skills.
-Write algorithms for real-life programs.
-Identify and address errors (non-explicit instructions) in algorithms.

"You" Section

- Teacher will transition the responsibility- allowing students to use the strategies they just brainstormed into their groups as they collaborate in the Graph Paper Pair Programming Activity below.

Now you try!

Choose one person to be Partner A and another person to be Partner B.

Partner A, choose one of the images below. Don't let your partner know which one you pick!

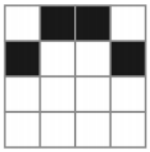


Image 1

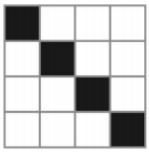


Image 2

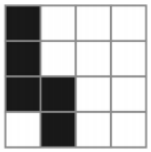


Image 3

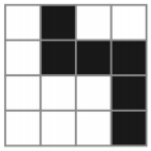


Image 4

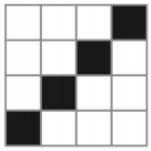


Image 5

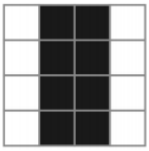


Image 6

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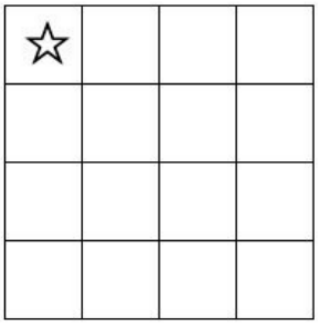
1) Partner A, write a program.
(Use → ← ↑ ↓)

Step 1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18

2) Give your program to your partner.

3)Partner B, draw your partner's program:



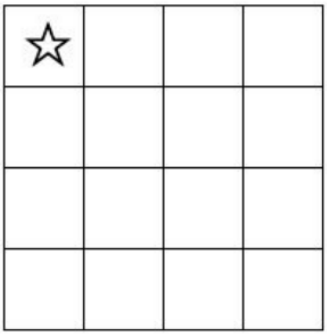
Switch!

1)1) Partner B, write a program.
(Use → ← ↑ ↓)

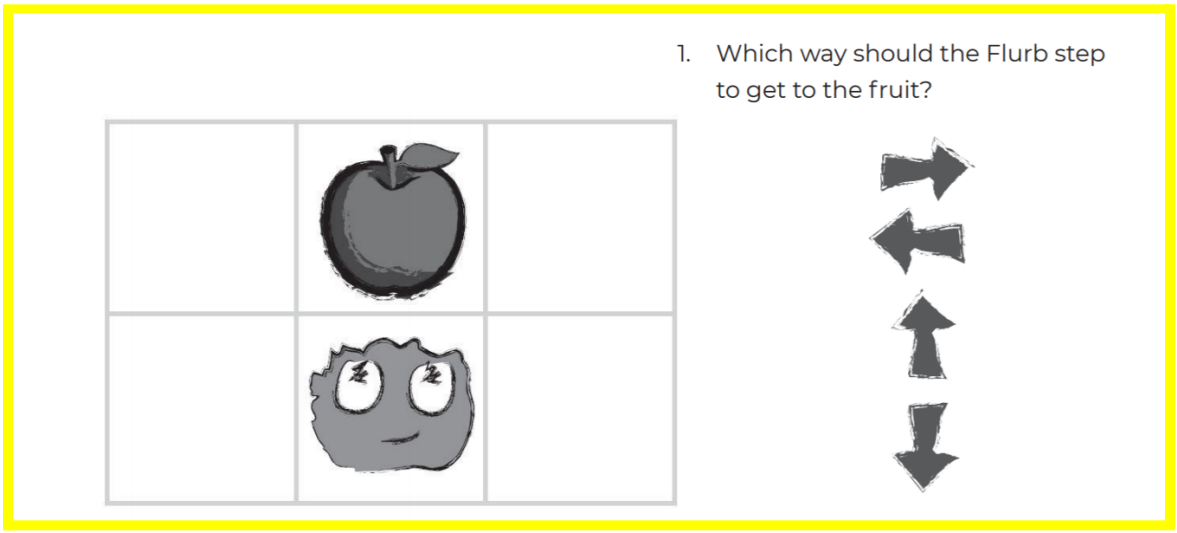
Step 1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18

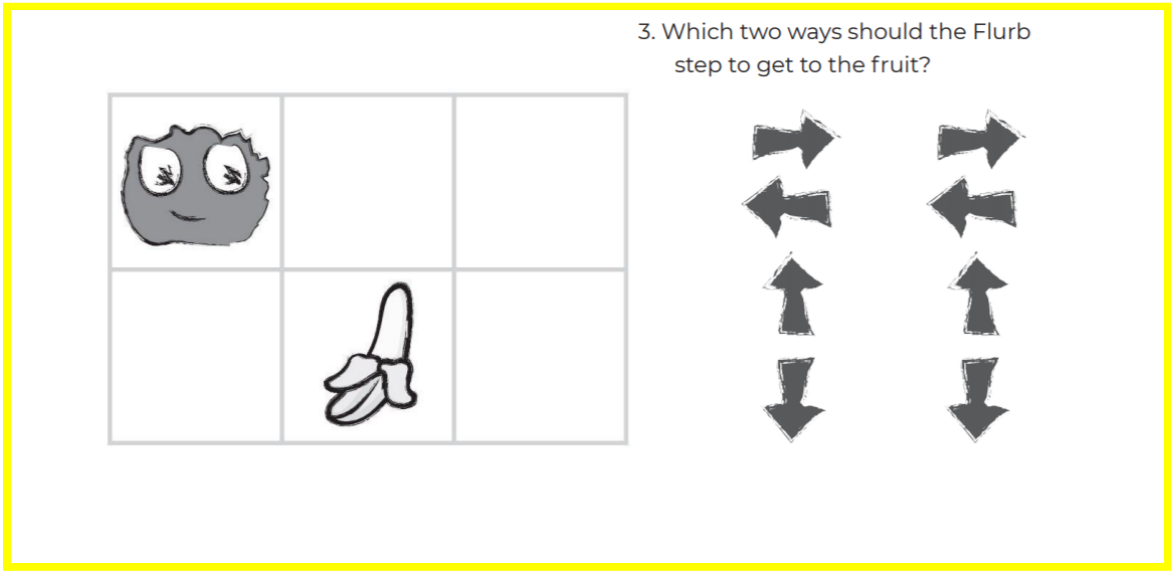
2)Give your program to your partner.

3) Partner A, draw your partner's program:



Student in need of more support:
Students will complete an activity that can be easier to understand and execute. Title is Happy Maps Pair Programming. Link is attached and a snippet of the activity can be seen below:





Summary/Closure:
Teacher will refocus the whole class to summarize the lesson. Two students will be asked to showcase their work, the success, difficulties and strategies implemented to improve their partnership. Following the sharing, a few thought-provoking questions will be asked:

Questions to ask:

1. How can pair programming support you as you create algorithms and programs?

Evaluation

To assess the students' ability to collaborate and take on both the driver and the navigator role. Teacher will walk around and probe their thinking through questioning. Teacher will use conference notes to record data.

Teacher will evaluate what the students have learned through teacher observations: verbal responses, student interactions, and their independent response.

Resource:
https://code.org/files/Hour-of-Code-Unplugged-Activities.pdf
file:///C:/Users/teacher/Downloads/Happy%20Maps%20Assessment.pdf (see attachment)