

Saturday Science Teaching – Spring 2020

Lesson Plan

LESSON #1 - Coding with Ruby, What is computer?

Kindergarten -1st grades

A) LEARNING OBJECTIVES

- Students will be able to learn about giving precise and specific directions.
- Students will be able to practice creating and writing algorithms to complete a variety of tasks.
- Students will be able to refine the definition of computer and why they believe something is a computer.

B) TEACHER CONTENT KNOWLEDGE

- Teachers must have an understanding of the role of computers in our life.
- Teachers must have a strong grasp on fundamental computer science concepts, including sequence, programming, coding, debugging.

C) MATERIALS

- Class presentation: https://drive.google.com/open?id=1iOAUzlg8AKFw93O_LUZrrhmXrUx620ep
- Video:
<https://www.youtube.com/watch?v=Te6ftIq9tDA>
- WorkSheet
<https://drive.google.com/open?id=1nb1uSDek9oDkOoId5Rz9j8dGRZQVPgCE>
- Computer
- Projection
- Board markers

- Pencils
- Crayons
- White papers

D) REFERENCES (list ALL references that you borrowed ideas from to develop this lesson – including any handouts you may distribute)

San Francisco Unified School District Creative Computing Lesson Plans. Retrieved from <https://sites.google.com/sfusd.edu/k-2cs/orange/unit-2-bee-bots/8-drawing-numbers-letters?authuser=0>

E) TENTATIVE TIMELINE (Keep brief—tables work well for this!)

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| 20 minutes | Introductions about the concept of computers |
| 30 minutes | Making our own computer |
| 10 minutes | Reading ‘Hello Ruby’ storybook |
| 30 minutes | Introduction about the concept of algorithms |
| 10 minutes | Sharing idea about teamwork |
| 30 minutes | Coding with Ruby’s map |

Snack time will be included

F) DESCRIPTION OF YOUR LESSON:

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| <p>Engage 30min</p> | <p>Introduce teachers and the program briefly. T shows how to do the simple chant, “Computer science is” and do it together with Ss</p> <p><i>Computer science is / Using the power of computers / To solve our problem / and express ourselves</i></p> <p>Share ideas about what a computer is and what we think we know about computers. T ask Ss to close their eyes and imagine all the computers they know about, all the computers they have seen, and all the computers they have touched or used.</p> <p>Focus : Some idea may not be accurate, but by recording Ss’ current thinking. Ts will revisit this idea to capture Ss’s evolved thought.</p> |
| <p>Explain 5 min</p> | <p>See the PowerPoint together and talk about different kinds of computers. Not to explain what it is, but to give place to think ‘computer can be in everywhere with different shapes.</p> <p>Focus : Draw Ss’ attention to how their computer receives input, process data, has storage, or output. Examples that challenge our traditional concept of computers(i.e. non-laptops, cell phones, tablets and even microwave)</p> |
| <p>Explore 30 min</p> | <p>Make the team (First grade with K) using the lego block. T introduce today’s activity ‘Making my computer’ and materials. Share Ss idea how to make their own computer. Ts send Ss back into the seat and give time to make the computer</p> <p>Focus: if there are children who are struggling to start to make it, Ts can ask a question such as “what color do you want?”, “What kind of computer do you want to make?” “Which computer is your favorite?”</p> |
| <p>Elaborate 5 min</p> | <p>T gives the opportunity to show their own computer to other friends. Ts ask Ss two questions:</p> <ul style="list-style-type: none"> • Why do you think it is a computer? • How does it work? |

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| <p>Engage 20 min</p> | <p>T invites Ss to listen to a story about an adventure a little girl named Ruby is about to go on. Tell Ss that Ruby is going to learn all about computer science during her adventure and that they are going to learn right along with her, too.</p> <p>Focus: Read Chapter 1-3 of Hello Ruby to Ss, allowing time for Ss to view the images on each page, and explain a few words to Ss, such as “cheekily”. Be sure to highlight the sequences of directions ruby follows when getting dressed and putting away her toys as well as the map she creates on.</p> <p>Ask Ss to recall what happened when ruby got dressed for school or put away her toys. In both instances, Ruby followed directions exactly as they were given, which resulted in her putting on her dress over her pajamas, and leaving her colored pencils on the floor because they are not “toys”. Explain to Ss that computers do the same thing: they follow the directions exactly as they are given, and they only do what the directions tell them to.</p> <p>T chooses one child to show how to follow the direction of the teacher. Challenge Ss to give you instructions for completing a simple task, such as moving across the classroom to pick up two books.</p> <p>T asks which types of directions worked best, leading Ss to realized that directions have to be very specific and given in order. Tell Ss that this is what computer scientists call an algorithm, which are the steps to complete the task.</p> |
| <p>Explain 15 min</p> | <p>Tell Ss that it is now their turn to write an algorithm to help ruby visit her friends. Display the map on the project, and model how you can write an algorithm using arrows to lead ruby from the starting point, over the bridge, to the penguin.</p> <p>Watch a video about - how to get along with others. T asks questions (Do you know why he can't go to the party? so how did howard solve the problem? How can we help to each other? what happen if 1st grade Ss do all the activity not discussing with younger classmates?) Share some idea how to share this activity and how to help each other.</p> |
| <p>Explore 20 min</p> | <p>Back to the group and create algorithms for Ruby to visit all 4 friends. Begin each algorithm at the starting point, using a directional arrow to show the path she would follow. T shows Ss how to create a “short cut” to avoid having to write so many of the same arrows in a row, using numbers to show how many times to repeat a command.</p> |
| <p>Elaborate 5 min</p> | <p>Ts bring all Ss together and have a discussion by the following questions:</p> <ul style="list-style-type: none"> • What tasks did you create algorithms in this activity? |

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| | <ul style="list-style-type: none">• What was the most challenging to do today? Fun? Interesting? |
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Lesson Plan

LESSON #2 - Coding with BeeBots

Kindergarten -1st grades

A) LEARNING OBJECTIVES

- Students will be able to define the functions of a BeeBot robot.
- Students will be able to use the functions of a BeeBot robot.
- Students will be able to program their BeeBot robots with a class dance.
- Students will be able to debug errors in an algorithm or program that includes sequences

B) TEACHER CONTENT KNOWLEDGE

- Teachers must have a solid understanding of giving and following clear commands.
- Teachers must have a strong grasp on basic computer science concepts including sequence, programming, coding, debugging.

C) MATERIALS

- Class presentation: https://docs.google.com/presentation/d/1CDRFFF_v0fEe3VUShIs3gBQ4FZxZ9iAk/edit#slide=id.p1
- Break songs: https://docs.google.com/document/d/1LcTezU_X43aL5WE0-Bh-bk_yhnfiVfhfADdhS-cwFZ0/edit
- 6 BeeBots

- Colored tape to make a ladder on the ground
- Colored print outs of Command cards, 6 colored Driver and Navigator Cards
- Computer
- Projection
- Boardmarkers
- Pencils
- Crayons
- White papers

D) REFERENCES (list ALL references that you borrowed ideas from to develop this lesson – including any handouts you may distribute)

San Francisco Unified School District Creative Computing Lesson Plans. Retrieved from <https://sites.google.com/sfusd.edu/k-2cs/orange/unit-2-bee-bots/8-drawing-numbers-letters?authuser=0>

<https://sites.google.com/sfusd.edu/k-2cs/red/unit-2-bee-bots/9-lets-help-debug?authuser=0>

E) TENTATIVE TIMELINE (Keep brief—tables work well for this!)

| | |
|------------|--|
| 30 minutes | Introductions to programming with BeeBot |
| 30 minutes | Coding with BeeBot |
| 10 minutes | Debriefing coding with BeeBots |
| 60 minutes | Robot stations |

Snack time will be included

F) DESCRIPTION OF YOUR LESSON:

1st part

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| <p>Engage 30 min</p> | <p>The teachers divide the students into two groups. Each T forms half a circle with the Ss. Each T teaches to their own groups. T holds a bee bot robot to the Ss and ask them what they see and elicit answers. Ts tells that this is BeeBot, it is a robot. Robots are a type of computers. BeeBot is a computer and robot that has wheels and buttons. T introduces direction buttons, go button, and the clear button by pointing to them and asking the Ss to repeat. E.g: 'Blue X' Ss repeat. 'Blue X means clear'. Ss repeat. T tells and does 'Now I am going to press forward, forward, go' and the Ss watch the robot go forward two times. T tells 'Beep beep means my program is done'</p> <p>T says that now Ss themselves will discover all the buttons in BeeBot. Ts put timer on screen. T divides the Ss into groups of 3-4. T gives a BeeBot to one student. T says that each student has a minute to explore BeeBot. T ask the Ss with the BeeBot that they should press the buttons and see what BeeBot does. Other Ss should observe what is happening so they learn some of the moves. After s/he is done, s/he should give the BeeBot to the next student.</p> <p>T debriefs the warm-up: 'What does the each button do?'</p> <p>T tells that now Ss are going to teach the Beebot how to dance today.</p> <p>T shows Ss the first slide. T tells that this is bug dance. T asks 'what is this?' Ss answers 'it is bug dance'. T asks Ss to read the dance sequence aloud one by one. Ss read. T asks Ss to read and perform dance sequence one by one. Ss read aloud and dance. T asks Ss to read the dance sequence silently and dance. Ss read silently and dance.</p> <p>T shows the second and third slides. T tells that each part of the Bug dance can be represented with a yellow command card. T repeats each command on the slides and asks Ss to repeat after her.</p> <p>Focus Question: What are the functions of BeeBot's buttons?</p> |
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| <p>Explore 30 min</p> | <p>All Ss are divided into groups of 4. Ts distribute one driver and one navigator card to each group. Ts also distribute several of command cards to each group. Ts say ‘drivers, raise your hand!’, Ts say ‘navigators, raise your hands’. Ts make sure there is a navigator and driver at each group. Ts say that Ss will recreate the bug dance from memory with the command cars. Only the navigator can touch the command cards but all group members should put input. Then Ts show the last slide and Ss check if their program is right. If not, they should correct it. Ts check each group’s program.</p> <p>Ts distribute one BeeBot to each group. The navigator should tell the commands one by one and the driver should touch to the BeeBot and program it. The other two Ss should check if the program is correct. If it is not correct, the navigator and command cards should pass to the other Ss and they start the programming from the start.</p> <p>If they are successful, Ts keeps on rotating the roles in the groups. Navigator creates dance sequence with the yellow cards. The driver programs it with BeeBot and the other two Ss observes. Ts check the groups’ accuracy.</p> <p>Focus: How to program BeeBots to make a predetermined sequenced dance?</p> |
| <p>Explain 5 min</p> | <p>Ts ask each group to describe how their robots move to produce the Bee Dance. Each group will also be asked to share one thing that did not work in their program and why it did not work, and how they corrected it.</p> |
| <p>Elaborate 5 min</p> | <p>Ts bring all Ss together and have a discussion by the following questions:</p> <ul style="list-style-type: none"> ● What is BeeBot? ● What are the buttons of BeeBot? What do the buttons do? ● What can you do with the BeeBot? |

Explore

60 min

Teachers create 6 stations and divide the students into the groups of 4. Each group explores a station for 15 minutes and then rotates. The stations consist of different educational robots for children: Botley, Osmo, Ozobot, BeeBot, Cubetto, Kosmos.

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Lesson Plan

LESSON #3 - Coding with BeeBots

Kindergarten -1st grades

A) LEARNING OBJECTIVES

- Students will be able to decompose the steps needed to solve a problem into a sequence of instructions
- Students will be able to develop plans that describe a program's sequence of events, goals, and expected outcomes.
- Students will be able to debug errors in an algorithm or program that includes sequences and simple loops.

B) TEACHER CONTENT KNOWLEDGE

- Teachers must have a solid understanding of giving and following clear commands.
- Teachers must have a strong grasp on basic computer science concepts including sequence, programming, coding, debugging.

C) MATERIALS

- Class presentation: https://docs.google.com/presentation/d/1WA7KND4PfUGt_TP2gnFM2Mrc9FxbEgih/edit#slide=id.p1
- 6 BeeBots.
- Colored tape to make a ladder on the ground
- Colored print outs of Command cards, 6 colored Driver and Navigator Cards

- Computer
- Projection
- Boardmarkers
- Pencils
- Crayons
- White papers

D) REFERENCES (list ALL references that you borrowed ideas from to develop this lesson – including any handouts you may distribute)

San Francisco Unified School District Creative Computing Lesson Plans. Retrieved from <https://sites.google.com/sfusd.edu/k-2cs/orange/unit-2-bee-bots/9-life-cycle-sequences?authuser=0>

https://docs.google.com/document/d/1JMHRFq2QPrND7sRamPxfMe_8nJcAxJA6xX0zj_RNRf4/edit

E) TENTATIVE TIMELINE (Keep brief—tables work well for this!)

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| 10 minutes | Warm-up |
| 20 minutes | Introducing life cycle |
| 20 minutes | Programming life cycle |
| 50 minutes | Collaborative debugging |
| 30 minutes | Algorithms with zigzags |

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| 15 minutes | Debriefing the day |
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Snack time will be included

F) DESCRIPTION OF YOUR LESSON:

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| Warm-up and review w 40 min | <p>Ts show the photos of the butterfly life cycle and repeat each cycle with the students. Then, Ts open a butterfly life cycle song and everybody sings along.</p> |
| Engage 20 min | <p>Ts get S into circles and says that they are going to teach their Bee-Bots about the life cycle(s) of a butterfly today. Their job is to decompose the problem of figuring out the correct sequence of the 4 parts of the life cycle, then program the Bee-Bot to navigate to each part in order.</p> <p>T asks students what are the parts of the life cycles of butterfly and then plays the butterfly song on the projection. Then T shows the third slide and asks ‘What is the first part of the cycle? What is the next? What is the next? What is the last? Where should BeeBot start to move? Where should it end?’</p> <p>T reminds students that it is a difficult task to do so they will decompose; break down the solution to smaller steps. T shows 3 step slides on the projection. T tells that she will only press 3 buttons. And presses the three buttons on the screen. T repeats this for 3 slides. T asks for volunteers to try the 3-button sequence the same way.</p> <p>T divides students into groups of 4 and gives one driver card and one board with butterfly circle on it. See an example board here. T tells that they will use decomposition, and it is something computer scientists use to break down a problem into smaller pieces. T asks S to gather around and models how she decomposes the</p> |

problems using 3-button sequence.

Focus: How to do decomposition with BeeBot?

Explore
50 min

T sends the students back into the groups. She tells that the driver repeats what the teacher did with getting input from the other group members. She tells that everyone is going to be the driver one by one. The process is repeated until each group member is the driver.

The groups are shuffled. T distributes [all role cards](#). Before doing so, she shows and reminds the role of each card. She tells that S will change the roles when they complete the program successfully. She tells that the designer designs the cycle as she wants. The navigator plans the program using the [command cards](#). The driver touches and moves the BeeBot according to the navigator's plan. If there is a mistake, the debugger fixes the program. T checks the groups and changes the roles when the groups are done. (Repeats this three times if there is time left.)

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| <p>Review 40 min</p> | <p>Ts draw several lines on the ground with tape before the class starts: Zigzags, ladders, straight lines with a concrete material at the end to mark the ending line. Ss are divided into groups of 4. They are given one driver card. T tells that Ss will first program the BeeBot by decomposing (T can remind what decomposing is) and then programming it all together. T examines the groups and change the challenge and the roles for each group. Ideas for route plans are here and here.</p> <p>Focus Question: How to program BeeBot to follow a path?</p> |
| <p>Explain 5 min</p> | <p>Everybody makes a circle and T debriefs the day:</p> <ul style="list-style-type: none"> ● How did you work with your group so that everyone got a turn to program the Bee-Bot? ● What is your favorite job to perform (<i>driver, navigator, designer</i>)? Why? |
| <p>Elaborate 5 min</p> | <ul style="list-style-type: none"> ● What was the most difficult task to do today? ● What did you do to achieve this difficult task? |

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Lesson Plan

LESSON #4 - Coding with Scratch Jr.-1

Kindergarten -1st grades

A) LEARNING OBJECTIVES

- Students will be able to learn appropriate tablet usage as they explore/review using Scratch Jr.
- Students will be able to use blue motion and purple looks blocks to create sequences of instructions to achieve simple objectives.

B) TEACHER CONTENT KNOWLEDGE

- Teachers must have an understanding of how to use a tablet
- Teachers must have a strong grasp on how to use Scratch Jr, including all the blocks and functions.

C) MATERIALS

- Class presentation:

<https://drive.google.com/open?id=1dZIm1Cg2jGP5AQgxz94eMguuA2CqfhO>

- Videos:

https://youtu.be/_9h16aL9I5w

<https://youtu.be/T2RwC7hN9mk>

- WorkSheet

<https://drive.google.com/open?id=1AmO7s-0TzAoDeLTn2Q5QNqIzwOKjKZ8d>

- 12 Ipads
- Computer
- Projection

- Board markers
- Pencils
- Crayons

D) REFERENCES (list ALL references that you borrowed ideas from to develop this lesson – including any handouts you may distribute)

San Francisco Unified School District Creative Computing Lesson Plans. Retrieved from <https://sites.google.com/sfusd.edu/k-2cs/orange/unit-2-bee-bots/8-drawing-numbers-letters?authuser=0>

E) TENTATIVE TIMELINE (Keep brief—tables work well for this!)

| | |
|------------|--|
| 10 minutes | Making connection Bee-bot with Scratch Jr. |
| 30 minutes | Introductions “What is Scratch, Jr?” |
| 30 minutes | Making our own program using the worksheet and code blocks |
| 25 minutes | Sharing opinion on how to use iPad safely and properly |
| 35 minutes | Making a program using Scratch, Jr. |

Snack time will be included

F) DESCRIPTION OF YOUR LESSON:

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| <p>Engage 10 min</p> | <p>Engage students by asking them to review the rules and procedures for using Bee-Bots in the Saturday science class. T invites a few students to share their answers with the class. T Connects the rules and procedures established for Bee-Bots with the rules students will use when handling tablets to use ScratchJr.</p> |
| <p>Explain 30 min</p> | <p>See the video about what is Scratch Jr, and how to use it. Using the power point slide, T shows and explains about all the sprites and basic blocks that Ss will use to day.</p> <p>Focus: Before telling to Ss about the function of blocks, give an opportunity for Ss to guess how this block works by only seeing the shape of block.</p> <p>T shows some example programs and connects iPad with a projector to show how to use Scratch Jr step by step.</p> <p>T introduces the activity for today. T shows materials and gives time for Ss to find what kinds of activity that we can do using these. T gives times for Ss to think about what program Ss want to make for today.</p> |
| <p>Explore 25 min</p> | <p>Using the worksheet, sprites, and code blocks, Ss make the scenes that they want to show. It can be part of the game or animation, or it can be the imaginary scene. If Ss want to make one more scene, Ts give more worksheets and code blocks.</p> |
| <p>Elaborate 5 min</p> | <p>T gives the opportunity to show their own worksheet to other friends. Ts ask Ss two questions:</p> <ul style="list-style-type: none"> ● How does it move? ● Can you tell me what is going to happen in this scene? |
| <p>Engage 20 min</p> | <p>T shows power points again that Ss saw to review the function of code blocks.</p> <p>T shows a video which is about how to use tablet safely. After watching the video, Ss share their idea and make the chart about the way of using iPad properly.</p> <p>Focus : There should be the conversation on how to share iPad with friends fairly.</p> |

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| <p>Explore 35 min</p> | <p>T tells Ss that it is now their turn to make their program. T introduces today's task.</p> <ul style="list-style-type: none"> • <i>Added Second Sprite.</i> • <i>Moved their second sprite to a new place on the screen(not to overlap)</i> • <i>Initialized their Scratch Kitten with a Start on Green Flag and Return to X(go home)</i> • <i>Sequenced blue movement blocks to reach their second sprite</i> • <i>Used a purple say block to say "HI" after scratch kitten reaches the other sprite.</i> <p>T also explains that after finishing all the tasks, there is the time for Ss to make their program, referring to the worksheet they made. Ss can make whatever program they want. T gives as much time as possible for Ss to explore Scratch Jr.</p> <p>Focus: In exploration time, Ts encourage Ss to ask and help them to solve the problem by themselves.</p> |
| <p>Elaborate 5 min</p> | <p>T gives the opportunity to show their own program to other friends. Ts ask Ss two questions:</p> <ul style="list-style-type: none"> • How does it move? • Can you tell me what is going to happen in this scene? |

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Lesson Plan

LESSON #5 - Coding with Scratch. Jr. -2

Kindergarten -1st grades

A) LEARNING OBJECTIVES

- Students will be able to use the functions of Scratch Jr.
- Students will be able to program a dynamic Scratch Jr program with at least 3 different scenes.
- Students will be able to debug errors in Scratch Jr.

B) TEACHER CONTENT KNOWLEDGE

- Teachers must have a solid understanding of how to program with Scratch Jr.

C) MATERIALS

- Class presentation: <https://docs.google.com/presentation/d/1o5cVXJhaN3kNGfdqYLhlLekhN3Y1cOiD/edit>
- Video:
<https://vimeo.com/103916939>
- Worksheet
https://drive.google.com/open?id=1xYx-n3agJt0JY1uk3jjDVFEEN_ejtg6Q
- 12 Ipads
- Colored print outs of story outlines

- Story books

D) REFERENCES (list ALL references that you borrowed ideas from to develop this lesson – including any handouts you may distribute)

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<https://sites.google.com/sfusd.edu/k-2cs/orange/unit-2-bee-bots/8-drawing-numbers-letters?authuser=0>

E) TENTATIVE TIMELINE (Keep brief—tables work well for this!)

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|------------|---|
| 30 minutes | Learning how to make animation on Scratch |
| 15 minutes | Making scene planner |
| 15 minutes | Reviewing how to use Scratch Jr. |
| 30 minutes | Creating stories on Scratch |
| 30 minutes | Sharing the stories on Scratch |

Snack time will be included

F) DESCRIPTION OF YOUR LESSON:

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| <p>Engage 10min</p> | <p>T shows the drill ‘part of computer’ and Ss follow the teacher. Do the drill with music, and do the drill quickly or slowly. Repeat drill several times.</p> <p>T ask questions about the book that Ss read before the class.</p> <ul style="list-style-type: none"> ● What did you read at morning? ● Do you like the book? And why? ● How many characters in the book? |
| <p>Explain 20min</p> | <p>T shows video about how to make animation using Scratch Jr, and T introduces today’s activity, making animation. T shows the example the animation that T made, explaining how it was made.</p> <p>T tells Ss that we need story to make an animation. T explains three characteristics of the story.</p> <p><i>The story has plot(contents)</i></p> <p><i>The story has a beginning, middle and the end.</i></p> <p><i>The story has characters.</i></p> <p>T shows the worksheet(Scene planner) that T has done, reading the story.</p> <p><i>“I read ‘A sick day for Amos McGee’ and I split the story into four section. Here is the story.”</i></p> <p>T explains how Ss design the animation and write the story, using scene planner.</p> |
| <p>Explore 15 min</p> | <p>Ss pick the story or make story, and design the animation using the scene planner. T helps them to pick the story, split the scene, and write the story.</p> <p>Focus: If there are Ss who can’t write, T should go and help them to write. Ts should ask “How many characters in the book?”, “What was the favorite scene of the book?”, “How can we split the story?”</p> |

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| <p>Explain 15 min</p> | <p>After Ss finish writing scene planner, back to the floor and review how to use scratch Jr. T shows the way to make their own sprite, using drawing function. T gives quiz about the name of code block, which helps Ss remind the functions. Ss learn the action of new code blocks.</p> |
| <p>Explore 30 min</p> | <p>All Ss are divided into groups of 2. Ss create the stories they planned on Scratch in pairs. The teachers keep the time by projecting a countdown on the screen. Ts guide the students by visiting the student tables. Ts help to the students by troubleshooting, facilitating with algorithms, and collaboration process.</p> <p>Focus: How to program Scratch Jr to create a story?</p> |
| <p>Explain 20 min</p> | <p>Ss make a circle in the ground. Each pair Ss share the programs their created with the whole class. Ts help students by projecting each Ipad. Each pair of S explain what they did in the program.</p> |
| <p>Elaborate 10 min</p> | <p>Ts debrief the day and the complete 5 weeks by asking what Ss learned, what their favorite parts, and elaborating on CS concepts the students have shared.</p> |