EXPLORE

V1-Experiment Procedure "Exploring Mars with Scratch"

GENERAL INFORMATION

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SHORT EXPERIMENT DESCRIPTION

Students design an easily playable game for rover exploration on Mars with the programming language Scratch (https://scratch.mit.edu/). The general idea is to use a surface photo of Mars as the background and a photo of a rover as the "character" that is played in the game.

The goal is to collect rock samples with the Rover by using the arrow keys to move it across the screen. Pressing the space key "collects" a rock, giving points to the driver. Various individual adjustments can be made, such as limiting the available time between collecting two rocks, having rocks spawn one after the other or more randomly, resetting the game after one collected rock, adding hurdles (such as valleys or mountains), etc. The basics of the game can be designed together with the class, while the learners can then add their own flair or ideas to the game, to then compete against each other.

HARDWARE CHECKLIST

	Laptop with internet access to access the software (https://scratch.mit.edu/)

PROCEDURE
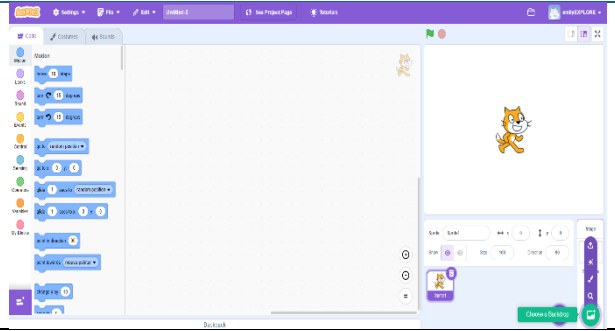
1 STARTING

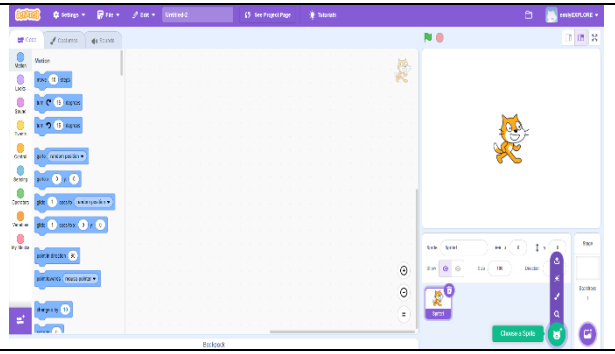| Step	Action	NOTES	Duration	Check
1	Go to the Scratch website and select **"Create"** to start a new project.		1 sec.	
2	Type a name for your project in the top row next to **"Edit"** to identify it.		1 min.	

2 SETTING BACKGROUND (MARS LANDSCAPE)

Step	Action	NOTES	Duration	Check
1	Download a picture of Mars's surface and save your laptop	Image can be found online	1 min.	

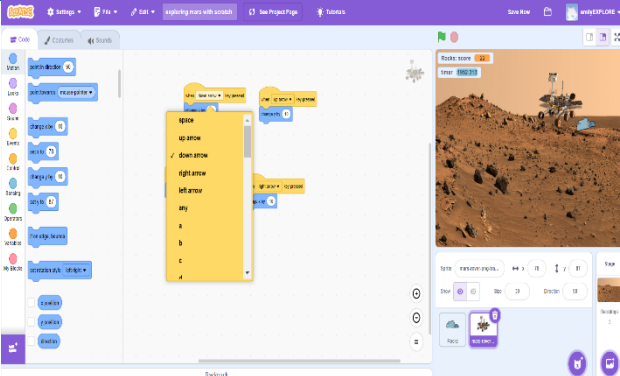| 2	In scratch,hover over the backdrop icon in the bottom-right corner,		1 sec.	
3	click **"Upload Backdrop"**, and select your Mars image.	Top of the column	8 sec.	
4	Choose the picture of Mars's surface from gallery	Adjust as needed in upper left corner under "Backdrops"	10 sec.	

3 ADDING ROVER and ROCK SAMPLES (SPRITE)

Step	Action	NOTES	Duration	Check
1	Download a picture of Mars Rover	Choose picture without background	1 min.	
2	Hover over the silhouette of a cat (sprite icon) on the far bottom right		1 sec.	
3	Click "Upload Sprite"	Top of the column	1 sec.	
4	Choose the picture of Mars Rover	Adjust as needed in upper left corner under "Costumes"	10 sec.	
5	Click on silhouette of the cat		1 sec.	
6	Search for rocks and click on the rocks to select	Use Scratch's search to find a rock sprite. These rock samples are the sample collection points	30 sec.	

4 MOVING ROVER

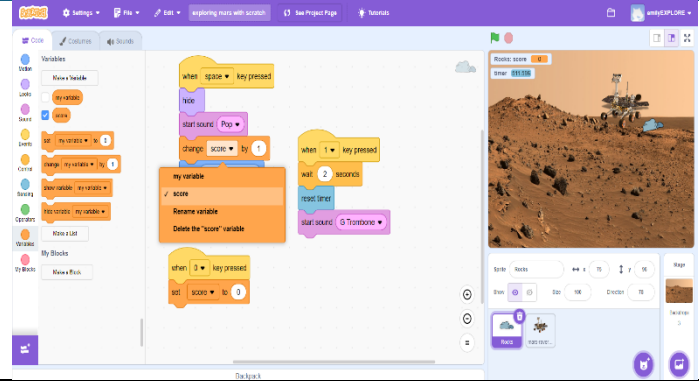| Step	Action	NOTES	Duration	Check
1	Click on rover sprite	Bottom right	0.6 sec	
2	Click on "Code"	Upper left corner	1 sec.	
3	Click on "Events"		1 sec.	
4	Select 'when space key pressed' and drag to empty white space	**"when [key] pressed"** blocks to the coding area, changing each block to match arrow keys for each direction.	10 sec.	

PROCEDURE "Exploring Mars with Scratch"

5	Change 'space' to any arrow (down arrow for downward movement, up arrow for upward movement, etc.)		5 sec.	
6	Repeat for all 4 arrows		24 sec.	
7	Click on "Motion"	Under **"Motion"**, use **"change x by"** and **"change y by"** blocks to set movement	0.6 sec.	
8	Select 'change y by 10' for upward movement		3 sec.	
9	Repeat but change the 10 to -10 for downward movement	To make sequence: stack yellow and blue blocks on top of each other without gap	10 sec.	
10	Select 'change x by 10' for movement to the right		10 sec.	
11	Repeat but change the 10 to -10 for movement to the left	positive values move up/right, negative values move down/left	10 sec.	

5 MAKE COLLECTABLE ROCKS

1	Click on the rocks	Bottom right	2 sec.	
2	Click on "Events"		1 sec.	
3	Select 'when space key pressed'		3 sec.	
4	Click on "Looks"		1 sec.	
5	Select 'hide'	to make the rock disappear when collected.	3 sec.	
6	Click on "Sound"	Generally to add sound	1 sec.	
7	Select 'start sound'	Adjust as wanted in upper left corner under "Sounds"	3 sec.	
8	Click on "variables"	to add score	1 sec.	
9	Select make variable and type in 'score'	**"score"** variable for tracking points	10 sec.	
10	pick 'for this Sprite only' and click 'ok'		4 sec.	
11	Put check in box 'score'		1 sec.	
12	Select 'change my variable by 1'	to update points each time a rock is collected	3 sec.	

13	Change 'my variable' to 'score'		5 sec.	
14	Click on "Motion"		0.6 sec.	
15	Select 'go to random position'	to make rocks appear in new places on the screen after collection	3 sec.	
16	Click on "Looks"		0.6 sec.	
17	Select 'show'		3 sec.	
18	Click on "Motion"		0.6 sec.	
19	Select 'if on edge, bounce'		3 sec.	

6 RESETTING SCORE

Step	Action	NOTES	Duration	Check
1	Click on "Events"		0.6 sec.	
2	Select 'when space key pressed'	for resetting	3 sec.	
3	Change 'space' to 0	or change to different desired key	5 sec.	
4	Click "variables"		0.6 sec.	
5	Select 'set my variable to 0'		3 sec.	
6	Change 'my variable' to 'score'		5 sec.	

7 ADDING AND RESETTING A TIMER

Step	Action	NOTES	Duration	Check
1	Click on "Events"		0.6 sec.	
2	Select 'when space key pressed'		3 sec.	
3	Change 'space' to 1	or change to different desired key	5 sec.	
4	Click on "Control"		0.6 sec.	
5	Select 'wait 1 seconds' and adjust to desired time	It Is to set time limits; the time in between pressing 1 and timer restarting	3 sec.	
6	Click on "Sensing"		0.6 sec.	

7	check the box 'timer'		0.8 sec.	
8	Select 'reset timer'	to start fresh each round	3 sec.	
9	Click on "Sound"		0.6 sec.	
10	Select 'start sound'	Choose different sound than in procedure 5	3 sec.	
11	Make adjustments, add flair, etc.	Set up obstacles to make it more challenging. **Test and Adjust**: Play your game to make sure everything works as expected and have fun!	30 min.	