Lifelong Kindergarten Group MIT Media Lab http://scratch.mit.edu

## PROBLEM-SOLVING AND PROJECT-DESIGN SKILLS

- logical reasoning
- debugging problems
- developing ideas from initial conception to completed project
- sustained focus and perseverance

## FUNDAMENTAL IDEAS ABOUT COMPUTERS AND PROGRAMMING

- Computer programs tell the computer precisely what to do, step-by-step
- Writing computer programs doesn't require special expertise, just clear and careful thinking

## SPECIFIC PROGRAMMING CONCEPTS

Concept	Explanation E	xample
sequence	To create a program in Scratch, you need to think systematically about the order of steps.	when space v key pressed go to x: 100 y: 100 glide 2 secs to x: 0 y: 0 say Let the show begint for secs play sound fanfare v until done
iteration (looping)	<b>forever</b> and <b>repeat</b> can be used for iteration (repeating a series of instructions)	repeat 36 play drum 54  for 0.2 beats move 10 steps turn ~ 10 degrees
conditional statements	<b>if</b> and <b>if-else</b> check for a condition.	if x position > 200 set x to -200 wait .01 secs
variables	The <b>variable</b> blocks allow you to create variables and use them in a program. The variables can store numbers or strings. Scratch supports both global and object-specific variables.	when a clicked set score to 0 forever move 10 steps if touching color ? change score by 1
lists (arrays)	The <b>list</b> blocks allow for storing and accessing a list of numbers and strings. This kind of data structure can be considered a "dynamic array."	add bread to food v add red apples to food v set counter v to 1 repeat length of food v say item counter of food v for 2 secs change counter v by 1



Concept	Explanation E	xample
event handling	when key pressed and when sprite clicked are examples of event handling – responding to events triggered by the user or another part of the program.	when left arrow v key pressed point in direction -90 v move 10 steps
threads (parallel execution)	Launching two stacks at the same time creates two independent threads that execute in parallel.	when clicked glide 3 secs to x: -75 y: 82 glide 5 secs to x: 179 y: -130 when clicked forever next costume wait 1 secs
coordination and synchronization	<b>broadcast</b> and <b>when I receive</b> can coordinate the actions of multiple sprites. Using <b>broadcast and wait</b> allows synchronization.	For example, Sprite1 sends the message winner when this condition is met: wait until score > 100 broadcast winner v This script in Sprite2 is triggered when the message is received: when I receive winner v play sound cheer v say You won the game!
random numbers	The <b>pick random</b> block selects random integers within a given range.	set x to pick random -100 to 100
boolean logic	<b>and, or, not</b> are examples of boolean logic.	when space with key pressed if touching color 2 and x position > 200 change score by play sound music wintil done
dynamic interaction	<b>mouse_x, mouse_y,</b> and <b>loudness</b> can be used as dynamic input for real-time interaction	forever set size to loudness * 4 % wait (0.01) secs
user interface design	You can design interactive user interfaces in Scratch – for example, using clickable sprites to create buttons.	when Sprite1 clicked change brightness v effect by 25 play drum 48 v for 0.2 beats change brightness v effect by -25
PROGRAMMING CONCEPT procedures and functions parameter passing and return values	• defining classes of objects •	JCED IN SCRATCH: exception handling text input file input/output

