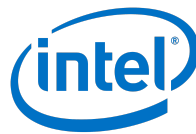




ANDROID APP DEVELOPMENT

Building Mash A Mole App

Session 4



YELLOW CIRCLE INC
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Teacher Lesson Plan

Building Mash A Mole App

Session Name:

Building Mash A Mole App

Summary:

This course teaches the basics of mobile app development using the App Inventor development tool.

Time Allotment:

75 minutes

Learning Objectives:

- *Utilize the App Inventor Designer to create a mobile app user interface*
- *Utilize the App Inventor Blocks Editor to program the behaviors for a mobile app*
- *Test the application using either a Android phone*
- *Modify the created app to change the user interface and/or programmed behavior*

Supplies:

- *Scrap paper / notepad to take notes*
- *Android tablet*
- *Laptop / computer with Internet access*

Learning Activities:

- **(5 minutes) - Session overview**

During this lesson, we will continue working with the App Inventor development tool. We will build a mobile app together and then you will use what you have learned to modify and customize the app.

- *Review App Inventor Tool*
 - *Designer & Blocks Editor*



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- *Coding Concepts - Review Development Blocks*
 - *Event Handlers*
 - *Commands*
 - *Expressions (“getter and setter” blocks)*
- *Coding Concepts - New*
 - *Declaring and working with Variables*
 - *Creating and calling Procedures*
 - *Sprite placement and layers*
 - *Timer use*
- *Building in App Inventor*
 - *Mash A Mole Project*
- **(2 minutes) App Inventor Designer & Blocks Editor**
 - *Designer*
 - *Used for designing how the app will look to the user*
 - *The app “user interface” - allow the user to interact with the app*
 - *This is also where you add non-visible elements and user input features*
 - *Media files*
 - *Sensors - (e.g. AccelerometerSensor for shake inputs)*
 - *Clock - i.e. Timer*
 - *Blocks Editor*
 - *Used for designing the app behavior*
 - *The app “programming”*
- **(8 minutes) Coding Concepts - Review Development Blocks**
 - *Event Handlers*
 - *The brown blocks are “event handlers” that are used to determine how the phone responds to user input (e.g. opening the app, click,*

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- shake)
 - In App Inventor, “event handler” blocks begin with the word “when”
- Commands
 - The purple blocks are “command” blocks that fit within “event handlers”. The “command” blocks indicate the action that happens in response to the user input.
 - Command blocks can be used to create “procedures” - a action or group of actions that can be called by name to create a program action
- Expressions
 - The green blocks are expressions that either get or set the current value of a property (aka getter or setter blocks)
 - “getter” blocks establish (contain) the value of a component (e.g. FontBold)
 - “setter” blocks change the value of a property
 - They are formatted as “set” something “to” some value (e.g. set Button1.Text to “Hello”)
- Variables
 - The orange blocks are used to work with “variables”
 - Item that stores a value that is used or acted upon by program conditions or information
- Lists
 - The light blue blocks are “list” blocks. Lists can be used directly or as part of variables
- Math
 - The dark blue blocks are used to perform math calculations that act in conjunction with other blocks
 - When fit together, the blocks can be read to describe the user and phone
- (60 minutes) - Group Activity : Build Mash A Mole

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*** Switch from slide show to Instructor screen share ***

Start New Project Build Mash A Mole

- Login to App Inventor
 - ai2.appinventor.mit.edu
- Select "Start new project" (1)
- Enter Project name (2) and click OK (3)



- (20 minutes) - Group Activity : Build Mash A Mole App User Interface

- Build the UI in Designer

Create the following components by dragging them from the Palette into the Viewer:

Component Type	Palette Group	What you'll name it	Purpose of Component
Canvas	Drawing and Animation	MoleYard	"Field" where holes are located



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Building Mash A Mole App

ImageSprite <i>Select and drop 5 on MoleYard</i>	<i>Drawing and Animation</i>	<i>Hole1 - Hole5</i>	<i>Holes where mole "pops up"</i>
ImageSprite	<i>Drawing and Animation</i>	<i>Mole</i>	<i>The mole</i>
HorizontalArrangement	<i>Layout</i>	<i>HorizontalArrangement1</i>	<i>To display the score</i>
Label	<i>User Interface</i>	<i>ScoreTextLabel</i>	<i>To hold "Score: "</i>
Label	<i>User Interface</i>	<i>ScoreValueLabel</i>	<i>Holds t score (# of times the mole was hit)</i>
Clock	<i>User Interface</i>	<i>MoleClock</i>	<i>mole movement control</i>
Sound	<i>Media</i>	<i>Buzz</i>	<i>Enables vibrate on mole touch</i>

Add Media Files

- Click Upload File button in the Media Pane to open Upload File Window (1)
- Click Choose File button and select image and sound files from ProjectFiles Folder (2)
- Click OK to upload media (3) - Repeat steps 2 and 3 to upload all media files

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Set the Component Properties

- Make the following changes to the components' properties:

Component	Action
Screen1	Set: AboutScreen to "Mash A Mole" Icon to "mole.png" Title to "Mash A Mole"
MoleYard	Set BackgroundColor to Green. Set Width to 320 pixels. Set Height to 320 pixels.
Hole1	Set X to 20 and Y to 60 (upper left).
Hole2	Set X to 130 and Y to 60 (upper center).
Hole3	Set X to 240 and Y to 60 (upper right)

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Hole4	Set X to 75 and Y to 140 (lower left).
Hole5	Set X to 185 and Y to 140 (lower right).
Mole	Set Picture to "BigMole.png". Set Z to 2 so the mole appears in front of the other ImageSprite s, which have the default Z value of 1.
ScoreTextLabel	Set Text to "Score: ".
ScoreTextValue	Set Text to "0".

About Sprites [Hole1-Hole5 and Mole]

- Explain Sprite setting for **X** is the horizontal position of the sprite [picture] on the screen
- Explain Sprite setting for **Y** is the vertical position of the sprite [picture] on the screen
- Explain that Sprite setting for **Z** is the front to back position of the sprite [picture] - positions move from low to high. Images with a **Z** value of 2 will be placed over those with a **Z** value of 1 at the same **X** and **Y** settings

Don't worry now about setting the **Picture** property for the holes; we'll set the property in the Blocks Editor.

Build the App Behavior in Blocks Editor

- Create global variable "holes"
 - For now, we will give it a "dummy" initial value of an empty list; we'll set the real initial value in the Screen1.Initialize event handler, which gets executed each time the app loads the screen.
 - Note: components cannot be referred to in variable initialize blocks, which are run before the app has started.



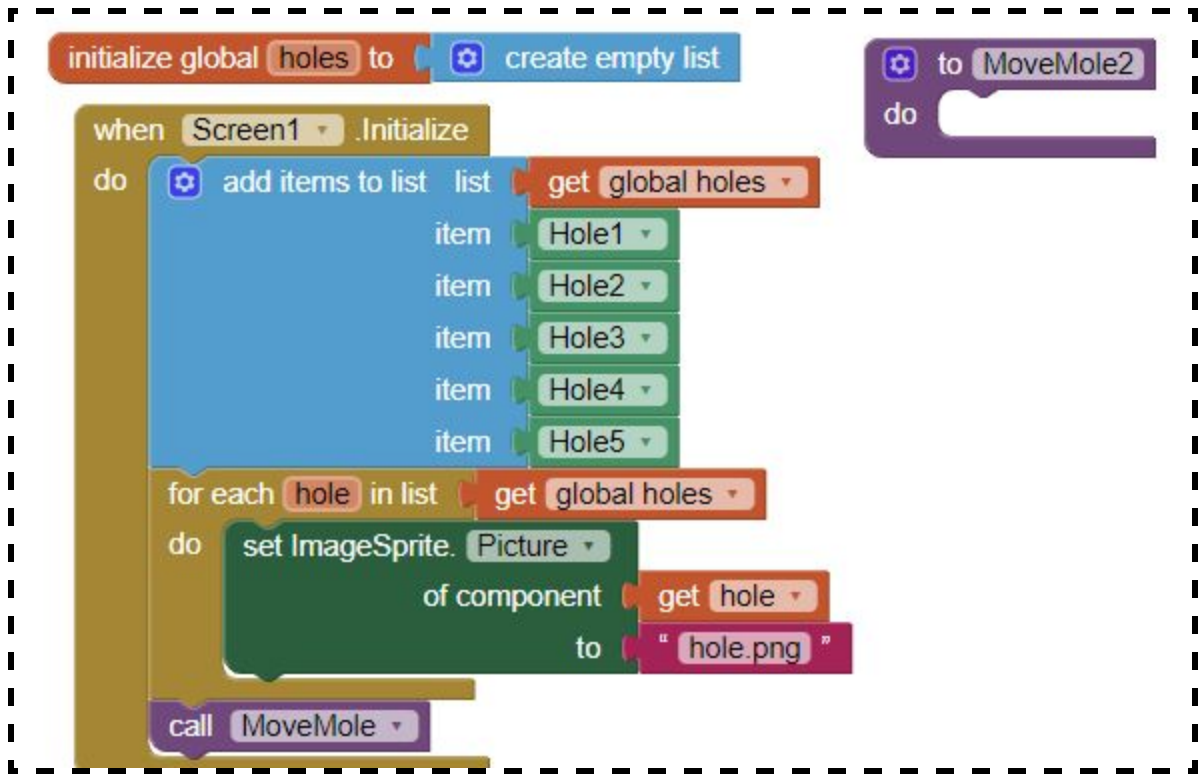
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Block Type	Drawer	Purpose
initialize global [name] to	Variables	Create global variable "holes"
create empty list	Lists	Holes where mole "pops up"

App Startup

- The first event to occur in any program is **Screen1.Initialize**, so we will put start-up code in that handler.
 - We will add the hole components to the list holes
 - Set each hole's **Picture** property to "hole.png"
 - Call **MoveMole** procedure
 - Note: Since we have not yet written MoveMole, we will create an empty procedure with that name, which we will fill in later.

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Block type

Drawer

Purpose

Screen1.Initialize

Screen1

Specify what should happen when the app starts.

add items to list

Lists

Add the following values to...

get global holes

Variables

...the list of holes:

Hole1

Hole1

-the upper left hole

Hole2

Hole2

-the upper center hole



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Hole3	Hole3	-the upper right hole
Hole4	Hole4	-the lower left hole
Hole5	Hole5	-the lower right hole
for each hole in list	Control	Specify that we would like a variable named "hole"....
get global holes	Variables	...to take on each of the values in the list holes .
set ImageSprite.Picture of component ... to	Any ImageSprite	Set the Picture property of...
get global hole	Variables	...the ImageSprite referred to by the variable hole ...
" " (hole.png)	Text	...to the picture of the empty hole.
to procedure (MoveMole)	Procedures	Create an procedure, to be filled in later, for moving the mole.
call MoveMole	Procedures	Call MoveMole to make the first placement of the mole.

Game Play - Move Mole

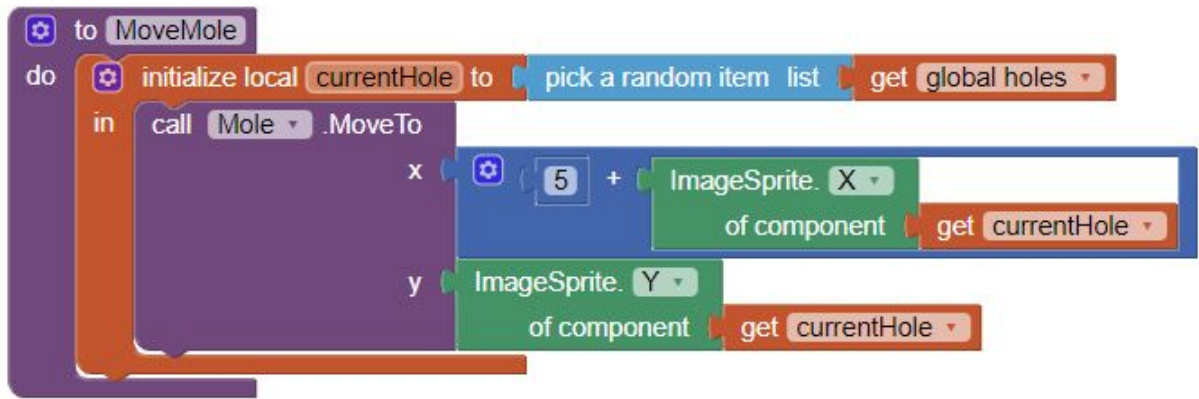
- Build the **MoveMole**. procedure
 - Randomly select one of the holes [currentHole] from the global holes list
 - Move the mole to the position of the selected [currentHole] hole
 - Note: Type value or select dropdown as shown below:



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Block type

Drawer

Purpose

initialize local currentHole to

(there are two types of 'initialize local': take the one that fits the procedure block)

Variables

Save the...

pick a random item

Lists

...randomly
selected...

get global holes

Variables

...hole.

call Mole.MoveTo

Mole

Move the mole to
the...

ImageSprite.X

Any component > Any
ImageSprite

...x-coordinate of...

get currentHole

Variables

...the chosen hole...

ImageSprite.Y

Any component > Any
ImageSprite

...and the
y-coordinate of...



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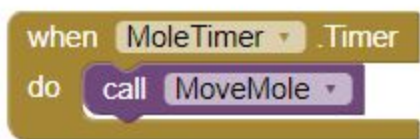
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`get currentHole`

Variables

...the chosen hole.

- **Set when the mole moves (i.e. when the `MoveMole` procedure is called)**
 - Select the `MoleClock.Timer` event handler (recall the `TimerInterval` value was set in the Designer `MoleTimer` Component Properties)
 - Insert the call `MoveMole` procedure to move the mole each time the `TimerInterval` is reached



Block type

Drawer

Purpose

`MoleClock.Timer`

`MoleClock`

When the timer goes off...

`call MoveMole`

Procedures

...move the mole.

Game Play - Register Action & Update Score

- **Register Mole Mash (when mole is touched)**
 - Select `Mole.Touched` event handler to direct actions when a mole is touched
 - Select the green "setter" block to set the score value
 - Use Math blocks to increment the `ScoreValueLabel.Text` by 1
 - Select a purple command block to call `buzz.vibrate` sound component
 - Use a Math block to set the vibrate duration to 100 milisecs
 - Select a purple command block to call `MoveMole` procedure to move the mole to the next hole



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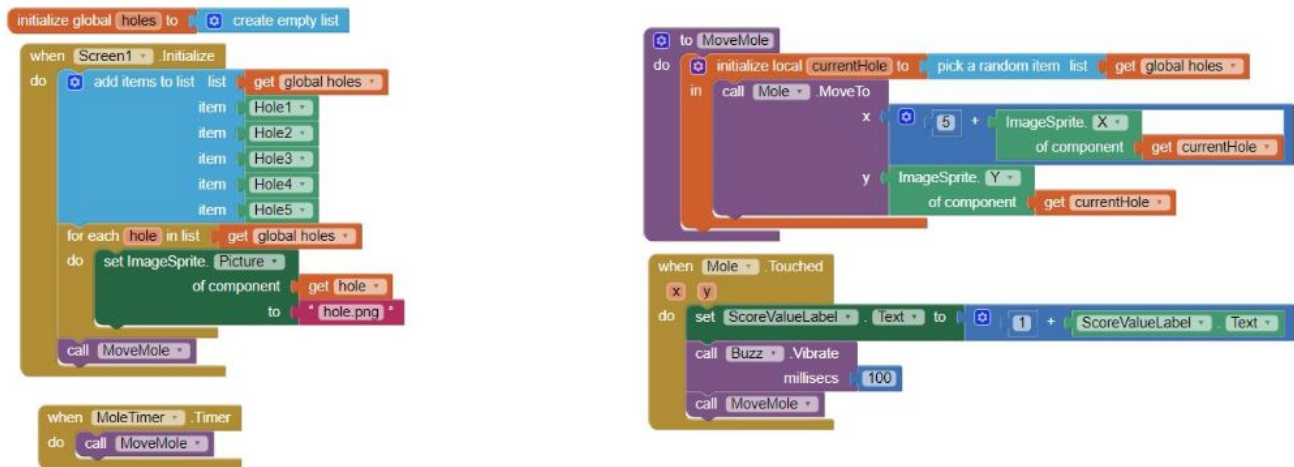
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Block type	Drawer	Purpose
Mole.Touched	Mole	When the mole is touched...
set ScoreValueLabel.Text to	ScoreValueLabel	...update the visible score to...
+	Math	...the result of adding...
1	Math	...1 [and]...
ScoreValueLabel.Text	ScoreValueLabel	...the previous score.
call Buzzer.Vibrate	Buzzer	Make the phone vibrate for...
100	Math	...100 milliseconds.
call MoveMole	Procedures	Move the mole to a new location.

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Game Complete - Full Blocks Editor View



- (5 minutes) - Group Activity : Test Mash A Mole App

Test using QR code

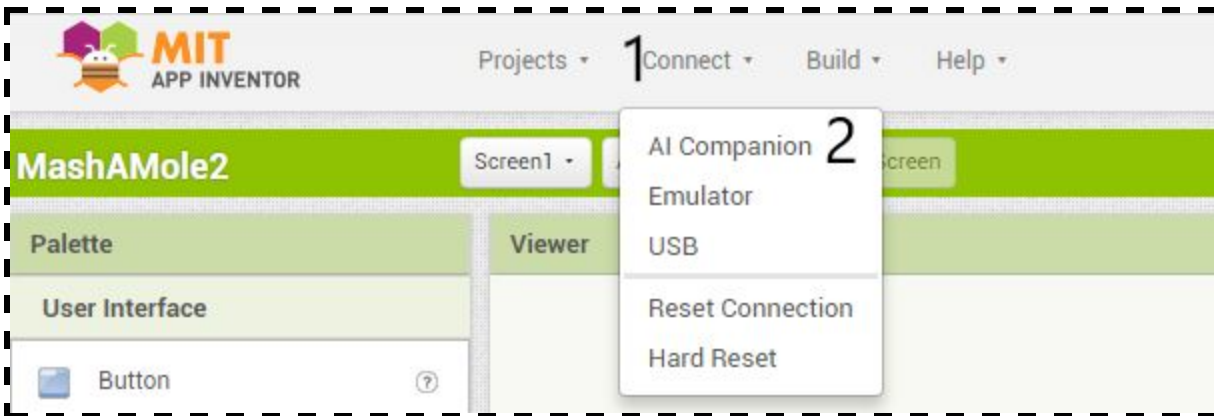
- **On your phone/tablet:** Open the MIT AI2 Companion App



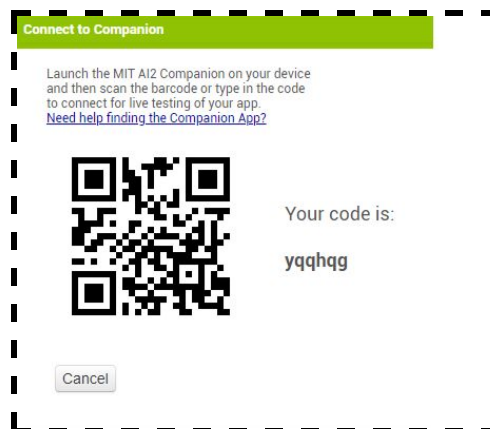
- **On your computer:** Select **Connect (1)** dropdown

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- Select **AI Companion** (2) wait while system compiles and packages the code (progress bar may be displayed)



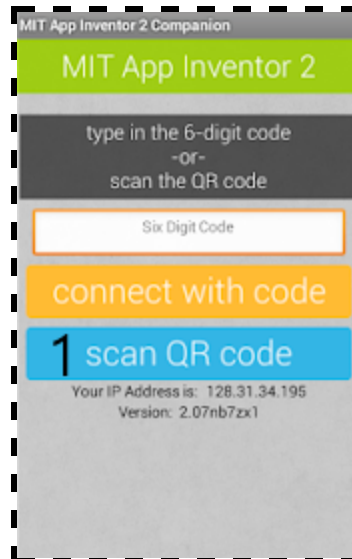
- When packaging is complete, QR code will be displayed.



On your phone/tablet: Select scan QR code (1) and scan.

- Note: If you do not want to use the QR scanner, you may select the connect with code button (orange) and enter the six character code (below "Your code is:" from the Connect to Companion window) in the app text box

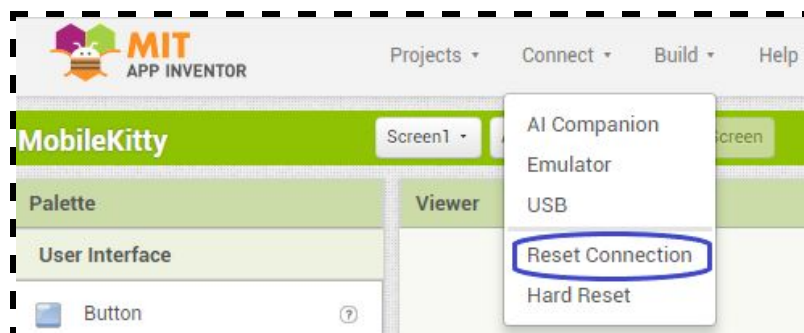
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- **On your phone/tablet:** The app you created will run. Test all functions and when done, use the back arrow to exit.
- **On your computer:** Click cancel to clear QR code window popup.
- Make any necessary changes and continue the process until you are satisfied with your results.

Note: If re-packaging and re-testing, causes the the AI Companion dropdown to stop responding (grey out) complete the following steps to reset:

- **On your phone/tablet:** Stop the app from the "3dot" menu in the upper right corner and select Stop and Exit from the pop-up window
- **On your computer:** From the Connect dropdown select Reset Connection



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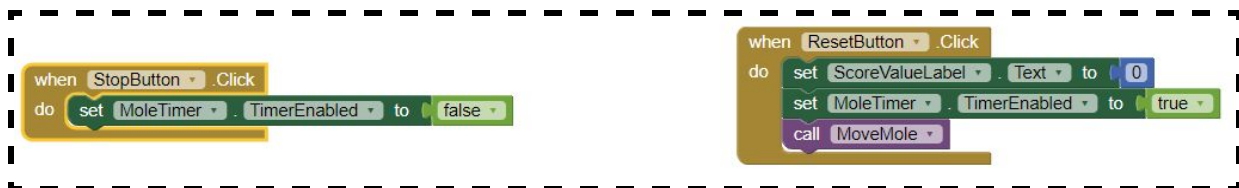
- **(30 minutes) - Student Activity : Modify & Test Mash A Mole App**

This is student time to use App Inventor to make the Mash A Mole app their own.

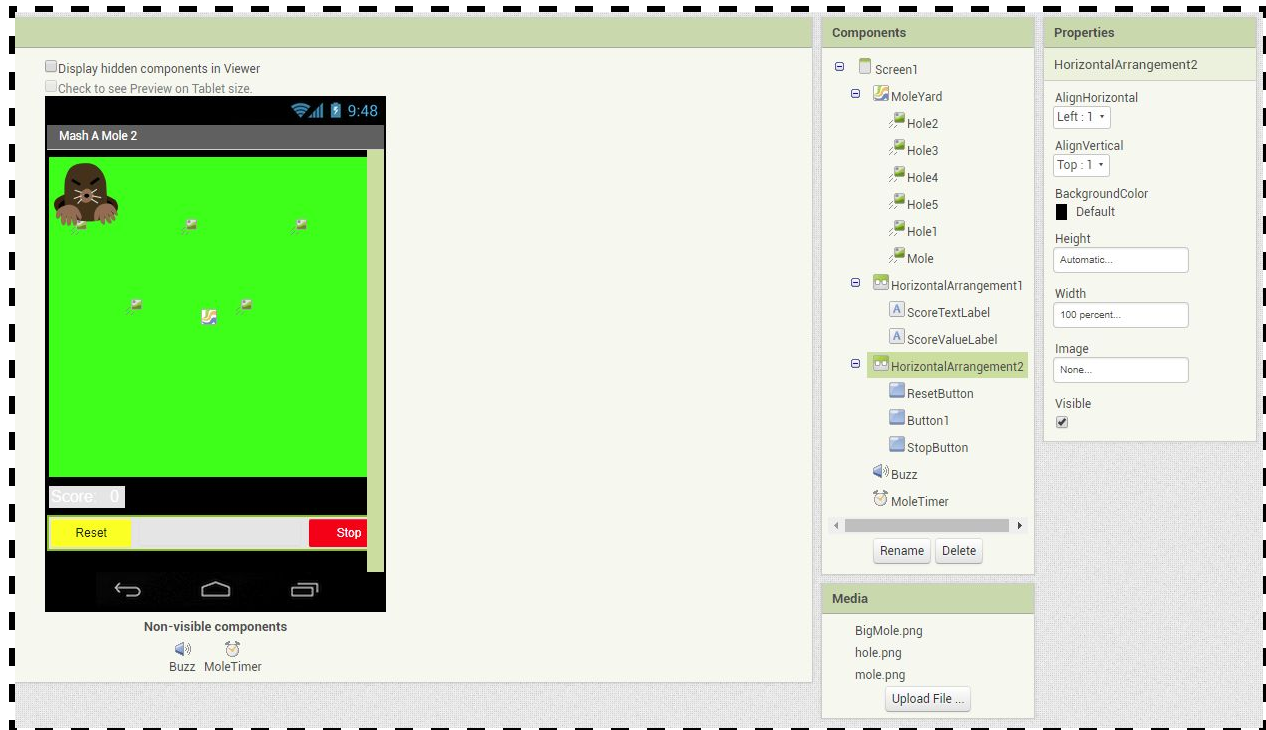
- *Encourage students to change the appearance & behaviors of the app*
 - *Modify colors, text, images*
 - *Add buttons to enable additional features*
 - *Add Reset Button*
 - *Add Stop Button*
 - *Add sound to vibration*
 - *Add additional holes*
 - *Change Icon Image*
 - *Change App Name*
- *Have students test their new apps for functionality & share with class if time allows*

- **(10 minutes) - Design Options**

Designer and Block Editor for Stop and Reset Buttons



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Properties

ResetButton

BackgroundColor
☒ Yellow

Enabled
☒

FontBold
☐

FontItalic
☐

FontSize
14.0

FontTypeface
default ▾

Height
Automatic...

Width
25 percent...

Image
None...

Shape
default ▾

ShowFeedback
☒

Text
Reset

TextAlignment
center : 1 ▾

TextColor
☒ Default

Visible
☒

Properties

Button1

BackgroundColor
☐ None

Enabled
☒

FontBold
☐

FontItalic
☐

FontSize
14.0

FontTypeface
default ▾

Height
Automatic...

Width
50 percent...

Image
None...

Shape
default ▾

ShowFeedback
☐

Text

TextAlignment
center : 1 ▾

TextColor
☒ Default

Visible
☒

Properties

StopButton

BackgroundColor
☒ Red

Enabled
☒

FontBold
☐

FontItalic
☐

FontSize
14.0

FontTypeface
default ▾

Height
Automatic...

Width
25 percent...

Image
None...

Shape
default ▾

ShowFeedback
☒

Text
Stop

TextAlignment
center : 1 ▾

TextColor
☐ White

Visible
☒



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- (2 minutes) - What's next?

Inform students to head back to cafeteria for closing remarks, awards and certificates.



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