

## Lesson Plan for Activity Evil Clutches (GameMaker)

**Teacher:** Alex Chen

**Date:** 7/26/2023

**Subject:** Video Game Design

**Length of Lesson:** 150 minutes

**Concept or Skill Focus:** Learning to utilize an IDE with many different editors and facets, as well as a more applied usage for drag and drop code.

**Goal:** Using GameMaker, participants will use various image and code assets to create a game.

### **Objectives/Outcomes:**

- Explain what sprites, objects, instances, and rooms are, and how they relate.
- Explore the various input and condition-based events GameMaker uses.
- Investigate the drag and drop commands needed to make the game's objects function.
- Demonstrate the usage of the room editor.

### **Activities and Timeline (Introduction, Middle, Conclusion)**

#### **Introduction: Hour One**

0-5: Introduction to GameMaker, and a gameplay demo of Evil Clutches.

6-15: Explanation/overview of GameMaker's basic systems and editors, and how they mesh.

16-25: Drawing up all the most essential objects on the whiteboard, and how they should go about programming them.

26-30: Allowing everyone to disperse to computers and get started on Game Maker Studio. (Perhaps do this earlier, during the previous steps, to save time?)

26-35: Going through step-by-step on the smartboard how to program the boss object and its projectiles, which can then be used to model player movement.

36-60: Allowing participants to go through and explore the IDE and all of its options for themselves, as well as make headway on developing the game itself.

#### **Middle: Hour Two**

61-70: Do a quick demonstration on how to get started making the player character, as well as a brief segment on any frequently asked questions.

71-100: More freeflow game development, going to the smartboard or doing 1 on 1 tech assistance and updating the whiteboard's essential object list (with code snippets) as necessary.

101-120: Adding baby dragons and points.

## **Conclusion: Hour Three**

121-130: A brief demonstration on how to add sound effects/a score counter, as well as variables that can be tweaked to make the game utterly broken.

131-180: Help some pairs get caught up, while gradually feeding other groups who are farther ahead experiment more with audio, graphics, and possibly the scripting aspect?

## **Materials**

- Computers with GameMaker (free version) downloadable for Windows from: <https://gamemaker.io/en/download>
- Projector
- Evil Clutches Resources (EvilClutchesResources.zip) downloadable from the Evil Clutches description section of my website
- Step-by-Step Instructions (below)

# Navigating the GameMaker Interface

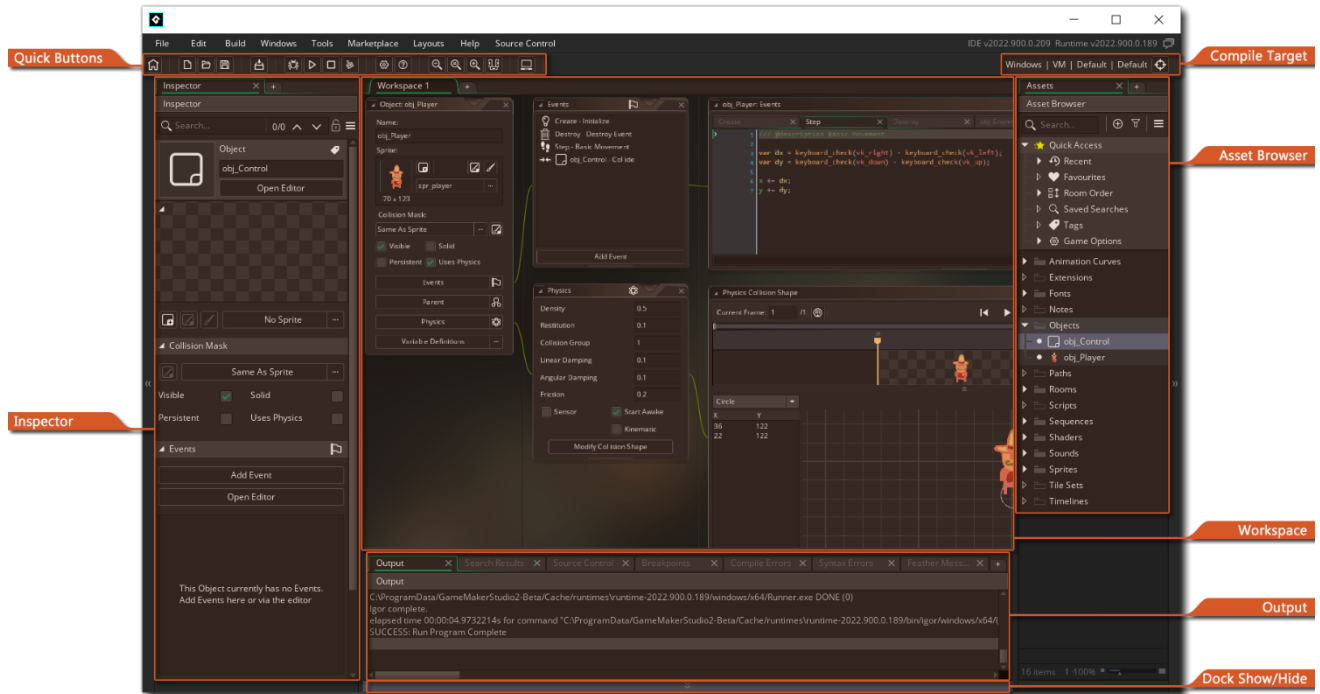


Image taken from <https://manual.yoyogames.com/#t=Introduction%2FWorkspaces.htm>

## Important Features

### Workspace:

Here you can **manipulate assets** like sprites and objects. Any asset you click in the browser will be opened in this space for you to work on.

### Asset Browser:

Here you can **locate and access all the assets** (sprites, objects, etc.) you have made.

### Quick Buttons:

The bar towards the top left of the editor contains buttons that can **save, open, and make new projects**. This is also where you will **start and stop your game for testing**.

### Inspector:

This window shows **information about what you have selected in the editor**, such as collision and sprite properties.

## Directions

*Directions from the Game Maker's Apprentice book by Jacob Habgood and Mark Overmars (2006), adapted for the latest version of GameMaker.*

## Game Description

You play a mother dragon who must rescue her hatchlings from an unpleasant band of demons that have kidnapped them. The band's boss sends a stream of demons to destroy the dragon as the hatchlings make their escape. The mother can fend off the boss's minions by shooting fireballs but must be careful not to accidentally shoot the hatchlings!

The arrow keys will move the dragon up and down and the spacebar will shoot fireballs. The player will gain points for shooting demons and rescuing young dragons but will lose points for any hatchlings that accidentally get shot. The game is over if the dragon is hit by a demon, and your final score will be displayed.

### Creating a new sprite asset for the game:

1. Right click the **Sprites** folder in the asset browser, then click **Create > Sprite** in the menus that appear. A new window should appear in the workspace.
2. Click on the **Name** field in the top right of the new window. Change the sprite's name to `sprite_dragon`.
3. Below the **Name** field, click the **Import** button.
4. Navigate to the `EvilClutchesResources` folder and select and open the `Dragon.gif` file.
5. Your dragon sprite is now created—you may close the sprite window.

### Creating the remaining sprites for the game:

1. Right click the **Sprites** folder in the asset browser, then click **Create > Sprite** in the menus that appear. A new window should appear in the workspace.
2. Click on the **Name** field in the top right of the new window. Change the sprite's name to `sprite_boss`.
3. Below the **Name** field, click the **Import** button. Select and open the `Boss.gif` file.
4. Repeat this process to import the rest of the `.gif` files into their own sprites. Give your sprites an appropriate name starting with the word `sprite`. Use only letters and the underscore symbol (e.g., `sprite_demon`, `sprite_baby`, etc.). Also make a sprite for the `Restart.png` and `Background.bmp` images.

### Creating a new object and assigning it a sprite:

1. Right click the **Objects** folder in the asset browser, then click **Create > Object** in the menus that appear. A new window should appear in the workspace.
2. In the **Name** field, change the object's name to `object_boss`.
3. In the **Sprite** field, there should currently be no sprite linked to the object. Click the field, find and click your **Sprites** folder, and select `sprite_boss`.

### Adding a create event for the boss object:

1. At the bottom of the **Events** window next to the **Object** window, click **Add Event**.
2. In the menu that appears, select **Create**. This will allow you to implement behavior (code) that executes as soon as an instance of the object is created (i.e., when it spawns).
3. In the **Action** window that appears, scroll down in the **Toolbox** on the left until you reach the **Movement** section.
4. Select the **Set Direction Fixed** action (the first in the section) and drag it into the **Action** window. Click the upward arrow in the code block that appears.

5. Then, drag in the **Set Speed** action (the fifth in the section) and connect it below the **Set Direction Fixed** block. In the **Speed** field, change the value to 8. These two blocks together make the object move 8 pixels upward for every step the game moves forward.
6. You may now close the **Action** form—leave the **Object** and **Events** window open.

#### **Add an intersect boundary event for the boss object:**

1. Click the **Add Event** button, then select **Other** > **“Intersect Boundary”**. This event allows you to control what happens when the object collides with an edge of the room.
2. Scroll down to the **Movement** section in the **Toolbox**, then drag in the **Reverse** action. In the action that is created, change the **Direction** field to **Vertical**.
3. You may now close the **Action**, **Events**, and **Object** forms for the boss object.

#### **Creating the Dragon object:**

1. Right click the **Objects** folder in the **Asset Browser**, then click **Create** > **Object** in the menus that appear. A new window should appear in the workspace.
2. Change the object’s name to `object_dragon`.
3. Change the object’s sprite to `sprite_dragon`.

#### **Adding a keyboard event for the dragon object:**

1. Click the **Add Event** button, then select **“Key Down”** > **Up**.
2. Add a **Set Direction Fixed** action upward and a **Set Speed** action with a value of 16.
3. Do the same for the event **“Key Down”** > **Down**, setting the direction to downward instead of upward.

#### **Adding a no key event for the dragon object:**

1. Click the **Add Event** button, then select **“Key Down”** > **“No Key”**.
2. Add a **Set Speed** action with a value of 0.

#### **Setting up the room:**

1. Find the **Rooms** folder in the asset browser, then click the triangle to the left of it to expand it and view its contents. Double click the room titled “Room1.” There should now be a black grid—the “room” where your game will be played, in place of the workspace.
2. In the **Inspector** on the left side of the editor, under the section **Room Settings**, change the **Width** field to 640 and the **Height** field to 480.
3. Above that section, change the room’s name to “Main”.

#### **Adding a dragon and boss to the room:**

1. Under the **Layers** section of the Inspector, click to select the **Instances** layer.
2. In the asset browser, expand the **Objects** folder. Click and drag the dragon object to the left side of the room you just set up.
3. Click and drag the boss object to the right side of the room. Make sure that the boss is completely in the room and not overlapping with the borders.
4. Your room should now look like the picture on the right.



### **Saving your work and running the game:**

1. Use the keyboard shortcut **Ctrl + S** or click the **Save Project** button on the **Quick Buttons** bar (top left) to save your project if you have not done so already.
2. Also in the **Quick Buttons** bar, click the **Run** button (the triangle) to test your game. A browser tab will be opened containing the latest saved version.
3. Check that the boss is moving up and down between the top and bottom borders, and that you can control the dragon's movement up and down as well with the arrow keys.

### **Creating the fireball object:**

1. Right click the **Objects** folder in the **Asset Browser**, then click **Create > Object**.
2. Change the object's name to `object_fireball`.
3. Change the object's sprite to the fireball sprite.

### **Adding the fireball object's events:**

1. Click the **Add Event** button, then select **Create**.
2. Add a **Set Direction Fixed** action to the right and a **Set Speed** action with a value of 32.
3. Click the **Add Event** button again, then select **Other > "Outside Room."**
4. Add a **Destroy Instance** action, found under the **Instances** section of the **Toolbox**.

### **Making the dragon shoot fireballs:**

1. Open the dragon object in the workspace again by double clicking it in the Asset Browser.
2. Click the **Add Event** button, then select **"Key Pressed" > Space**.
3. Add a **Create Instance** action.
4. Click the button next to the **Object** field to select an object to instantiate. Navigate to the **Objects** folder, then select the fireball object.
5. Input the value 100 in the **X** field and a value of 10 in the **Y** field. Check off the **Relative** box next to both fields. This ensures that the fireballs will be launched from the location of the dragon's head instead of the middle of its body.

### **Setting up the scoring system:**

1. Open the boss object in the workspace again and open its **Create** event.
2. Under the **Common** section of the **Toolbox**, add a **Set Global Variable** action. In the **Name** field, input `global.score`.
3. Input 0 for the **Value** field, and leave the **Relative** box unchecked.

### **Creating the demon object:**

1. Using a similar process as for the other objects, create a demon object with the corresponding name and sprite.
2. Add a **Create** event and drag in a **Set Direction Random** action. Select all three arrows pointing to the left. This makes the demon pick randomly between the three movement directions when it is created.
3. Add a **Set Speed** action with a value of 12.
4. Add an **Other > "Intersect Boundary"** event and drag in a **Reverse** action. Change the direction to **Vertical**.
5. Add an **Other > "Outside Room"** event and drag in a **Destroy Instance** action.

### **Adding an event to the demon object for colliding with the fireball:**

1. Click the **Add Event** button, then hover over **Collision > Objects**. Select the fireball object out of the options that appear.
2. Add a **Destroy Instance** action.
3. Add a **Set Global Variable** action. Input 100 for the **Value** field and check off the **Relative** box.

### **Making the restart button:**

1. Create a restart button object with the corresponding name and sprite.
2. Click the **Add Event** button on the new object, then select **Draw > "Draw GUI"**.
3. Add a **Draw Value** action, found in the **Drawing** section of the **Toolbox**.
4. Set the **Caption** to "Score: " (including the double quotes) and the **Value** to `global.score`.
5. Set the **X** field to 0 and the **Y** field to -100. Check off the **Relative** box for both fields. This will display the final score of the player above the restart button.
6. Add a **Gesture > Tap** event. Drag in a **Go To Room** action (found under the **Rooms** section of the **Toolbox**).
7. Click the button next to the **Room** field, then find and select the Main room. This allows the player to restart the game when they click the button.

### **Adding a game over screen:**

1. Right click the **Rooms** folder in the asset browser, then click **Create > Room**.
2. Change the new room's name to `GameOver`, its **Width** to 640, and its **Height** to 480.
3. Drag in the restart button object into the middle of the room.

### **Adding an event to the dragon object for colliding with a demon:**

1. Open the dragon object in the workspace.
2. Click **Add Event**, then select the demon object under **Collision > Objects**.
3. Add a **Go To Room** action, inputting the new `GameOver` room into the **Room** field.

Now we are going to make the game randomize when the demons will appear.

### **Adding a step event to the boss object:**

1. Open the boss object in the workspace.
2. Click the **Add Event** button, then select **Step > Step**.
3. Drag in an **If Expression** block.
4. In the **Expression** field, input the expression `random(50) < 1`. This picks a random number from 0 to 50 and checks if it is smaller than 1, simulating a 1/50 chance.
5. Drag in a **Create Instance** action and attach it to the right of the **If Expression** block. This allows the action to occur only if the **If Expression** is true.
6. In the **Create Instance** action, use the button to the right of the **Object** field to select the demon object. Leave both the **X** and **Y** fields as 0, but check off both of the **Relative** boxes.

Now, you can test the game again by running it. You should be able to move as before, but also destroy demons by launching fireballs from your mouth. If you are hit by a demon, you should be transported to another screen displaying your score with an option to restart the game.

We are now going to add to the challenge by adding baby dragons along with demons. If a baby dragon is shot, you will lose 300 points, but if you rescue one, you will earn 500 points.

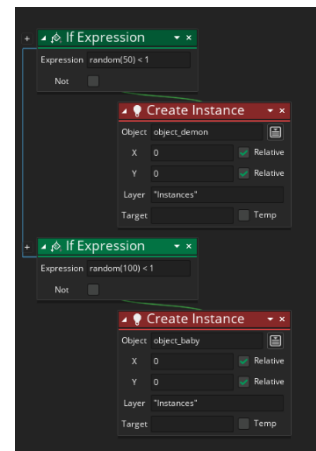
### Creating a new baby dragon object and its events:

1. Create a baby dragon object with the corresponding sprite and name.
2. Add a **Create** event. Drag in a **Set Direction Fixed** action to the left, and a **Set Speed** action with a value of 8.
3. Add an **Other > “Outside Room”** event and drag in a **Destroy Instance** action.
4. Add a **Collision** event with the fireball object and drag in a **Destroy Instance** action.
5. In the same **Collision** event, also drag in a **Set Global Variable** action. Set the name to global.score, with a value of -300. Check off the **Relative** box.
6. Add another **Collision** event but now with the dragon object and drag in a **Destroy Instance** action.
7. Also drag in a **Set Global Variable** action. Set the name to global.score and check off the **Relative** box as before, but now input a value of 500.

Now we will make the boss object release baby dragons along with the demons, but less often.

### Editing the boss object to create baby dragons:

1. Open the boss object in the workspace again.
2. Click on the existing **Step** event to open it.
3. Attach another **If Expression** below the currently existing one. Input a similar **Expression** to the previous, but use random(100) instead of random(50). This will make the baby dragon spawn chance 1/100 every step, as opposed to the demon spawn chance of 1/50.
4. To the right of the new **If Expression**, attach a new **Create Instance** action. Set the **Object** field to the baby object, and check off both of the **Relative** boxes. Your action structure should be similar to that in the image on the right.



We are now going to improve the game experience with a background, music, and sound effects.

### Giving the room a background:

1. Double click the **Main** room in the Asset Browser to open it.
2. In the **Inspector** on the left, under the **Layers** section at the top, click on the **Background** layer.
3. Right above the **Properties** header, there should be a button saying “No Sprite.” Clicking this button will allow you to specify a sprite to use for your background. Find and select the background sprite.

### Creating the sound assets:

1. Right click the **Sound** folder in the asset browser and select **Create > Sound**.
2. In the window that appears in the workspace, change the **Name** field to sound\_music.
3. To the right of the **Name** field there should be a button with three dots allowing you to import a sound file from your computer. Click it, and import the Music.mp3 file from the resources folder.
4. Follow a similar process to create the sound\_baby and sound\_demon assets.



### **Setting up background music:**

1. Open the boss object in the workspace and open its existing **Create** event.
2. Add a **Play Audio** action, located under the **Audio** section of the **Toolbox**, and input the music asset in the action's **Sound** field. Check off the **Loop** box.
3. Open the dragon object in the workspace and open its existing **Collision** event with the demon object.
4. Drag in a **Stop All Audio** action.

### **Playing sound effects for shooting baby dragons and demons:**

1. Open the demon object in the workspace and open its existing **Collision** event with the fireball object.
2. Add a **Play Audio** action and select the demon sound for the **Sound** field. Do not check off the **Loop** box.
3. Repeat the a similar process to add a fireball collision sound for the baby object as well.

If you run the game again, it should be basically complete! There should now be music and a background, along with sound effects when your fireballs hit demons and baby dragons.

### **EXTRA - Adding a high score tracker:**

1. Open the boss object in the workspace and add an **Other** > **“Game Start”** event.
2. Add a **Set Global Variable** action with name `global.highscore` and value 0.
3. Open the dragon object in the workspace and open its existing **Collision** event with the demon object.
4. Add an **If Expression** block with an **Expression** of `global.score > global.highscore`.
5. To the right of the **If Expression** block, attach an **Set Global Variable** block with name `global.highscore` and value `global.score`. This compares the game's final score with the previous high score and sets the high score to the new value if needed.
6. Open the restart button object in the workspace and open its existing **Draw GUI** event.
7. Add a new **Draw Value** action. Input **“High Score: ”** (with double quotes) in the **Caption** field, and `global.highscore` in the **Value** field.
8. Keep the **X** field at 0, and change the **Y** field to -50. Check off both **Relative** boxes.

When each time you restart, your game should now keep track of your high score for the session and display at the game over screen.