



UNREAL
ENGINE

The Key To Unlocking The Final Area: Working With Conditional Statements In Unreal Engine

Teacher guide

Overview

Unreal Engine is an immersive 3D game engine that powers some of the most popular video games in the world. While some games require teams of professionals to produce a final product, you can get started with no experience. Rather than focusing solely on basic concepts of computer programming, you'll jump straight into building a video game. This series of activities is designed to guide you through the process of creating a 3D video game while highlighting the important computing concepts along the way. We hope the promise and excitement of building a video game will give you the context and motivation to learn essential computer programming concepts.

This entire program contains five (5) Hour of Code activities that combine all the concepts and instructions you need to complete a 3D video game that you can play and share with friends. The activities and included project files are designed to be done in order from beginning to end or you can select any single activity to complete individually. Each activity holds exciting new challenges and discoveries that unlock the power of game development using Unreal Engine.

About this Activity

We have created jumping challenges, moving platforms, collectibles, power-ups, and now it's time to introduce the final challenge. The secret to completing the game is hidden behind a locked door in a fortress located high up in the sky.

You'll be using the Blueprint visual scripting system to create the secret key and hide it in your world. Armed with the Blueprints you've already created; the floating islands, collectible coins, jump boost power-ups, and a secret key, you'll be able to test your skills at game design. When the player finds the key, unlocks the door, and reaches the end goal, they'll see their score. Players can compete for the best score!

At the end of this activity, you'll be able to play your game from beginning to end.

Getting Started

If you have not downloaded **Unreal Engine** and the **Hour of Code Project**, see the [Getting Started Guide](#) to do so. If you have, open the project and begin!

In this lesson, you'll learn how to work with **conditional statements**. The condition is finding a key to open the door. Once inside, you can complete the game.

Good Luck!

Programming Concepts

You will be digging deeper into the Blueprint visual scripting system of Unreal Engine. In this activity, you will be creating a secret key that will be used to unlock the final level. You will achieve this by implementing Boolean variables and a Conditional Statement; a concept in programming where code logic will only be executed when certain conditions are met.

When building your Blueprint asset, you will experience the process of solving a complex problem by using code to break it down into a series of smaller simple steps. You can connect these steps in a logical flow to complete your goal. Programming teaches the valuable skill of breaking big problems into a series of simple steps. As you master this process, you'll become a better at solving problems and you'll be empowered to create anything you can imagine!

Preparing the Activity

If you have completed Activities 1, 2, and 3, you can skip this section and choose to build on the work you've already achieved.

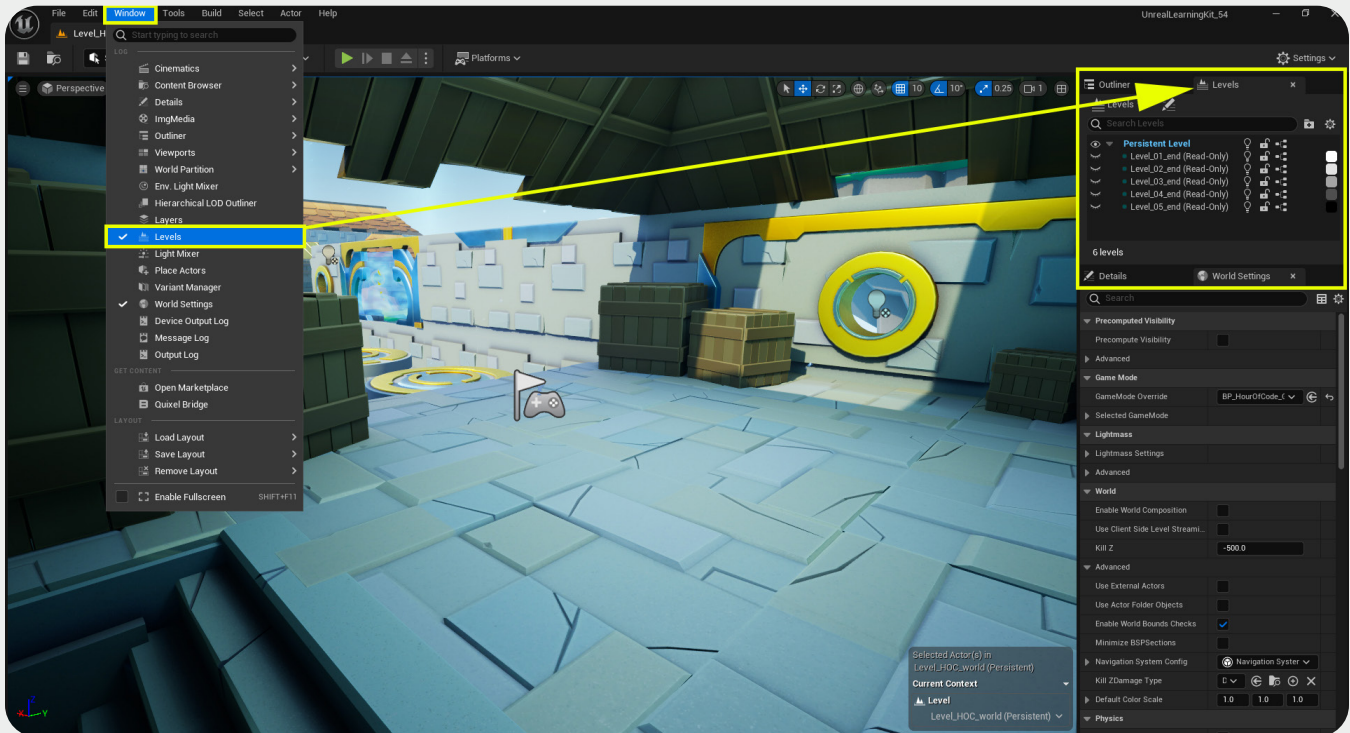


fig a

If you are starting here at Activity 4 or would like to have a fresh start, please follow these instructions for starting a new project.

Since we are starting at Activity 4, you will need to load the completed sample versions of Activities 1, 2, and 3, to start your game from the beginning. Completed samples for each level are included in the sample project.

Follow the steps below to load the content from levels 1, 2, and 3. The completed levels are found in the Levels. This can be displayed by navigating to **Windows > Levels**. Click and drag the window by the tab to dock it next to the **Outliner** so we can use it later.

Load the completed level by navigating to the **Levels** panel and **right-clicking** on **Level_01_End** and choosing **Change Streaming Method > Always Loaded**. This will load the example level when you play the game. Repeat this step for **Level_02_End** and **Level_03_End**. You don't need to load the other levels, so you may choose to leave the **Blueprint** option checked for now.

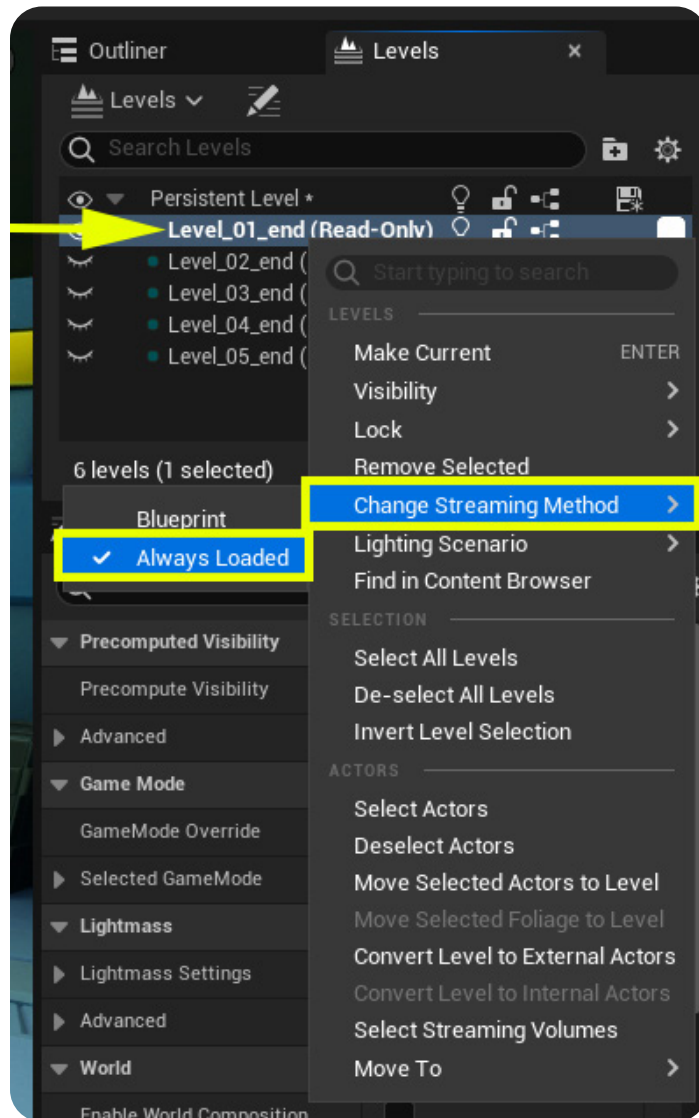


fig b

Teacher Note

If a student joins the activity without completing the first activity, you can use these example levels. They also will allow you to break up this entire project to be taught in any order you wish, or only teach specific activities as you see fit. For example, if you are starting on activity 3, make sure the student toggles activity 1 and 2 to Always Loaded.

Note

Make sure **Persistent Level** is shown in **bold** text. If you double-click one of the other levels, i.e. **Level_01_end**, that level becomes active. This means that when an actor is added to the **Viewport** it will be added to the **Level_01_end level**. The other levels will still be visible, but not available for editing in the Viewport. Within these activities we will only be adding assets to the **Persistent Level**. The level name that is in **bold text** is the active level.

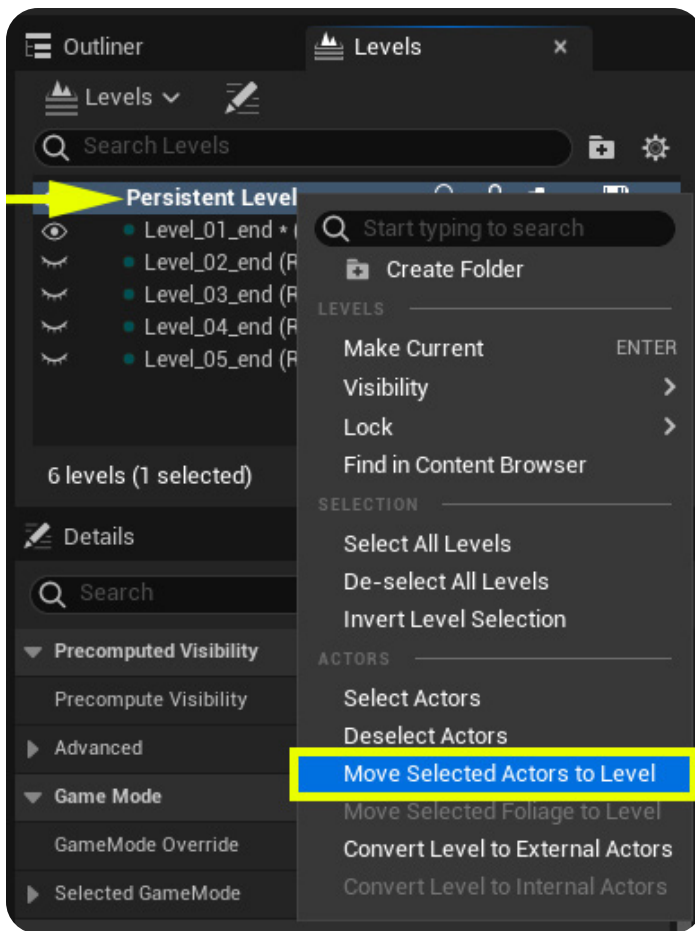


fig c

Trouble Shooting

If an actor is added to any level other than the **Persistent Level**, simply select the actor, and **right mouse click Persistent Level** and choose **Move Selected Actors to Level**.

Time-saving Tips

We have added a few helpful things to the project. Take a moment to review these tips.

Camera Bookmarks

Camera bookmarks are useful for quickly changing your location in the editor. To see how they work, first click anywhere inside the **Viewport**, then press the number **1** or **2** at the top of your keyboard. You will notice that the camera will jump to specific locations.

- 1 = beginning location of activity 1
- 2 = beginning location of activity 2

This will allow you to quickly move around your level without having to manually navigate from one place to another. Buttons 1 – 0 are assigned to important bookmarks for this course, and you can assign your own camera bookmarks by pressing the **Ctrl + any number** at the top of your keyboard.

Your Turn: Set another camera bookmark somewhere in the level using **Ctrl + 8**. To check if it worked, you can revisit other camera bookmarks by pressing a number between 1 and 7. Now press 8 on the keyboard and it should bring you to the bookmark you created. Did it work?

Play From Current Location

Did you know that you can start the game from where the camera is currently located? To set this up, simply open the drop-down menu next to the **Play** button and choose the **Current Camera Location** option. This will save you a lot of time when playtesting your levels. Just be aware that if you start the game above a void, your player will fall into the void and respawn.

This series of lessons has been designed to introduce students to computer science concepts in the context of using the industry-standard game development tool, Unreal Engine.

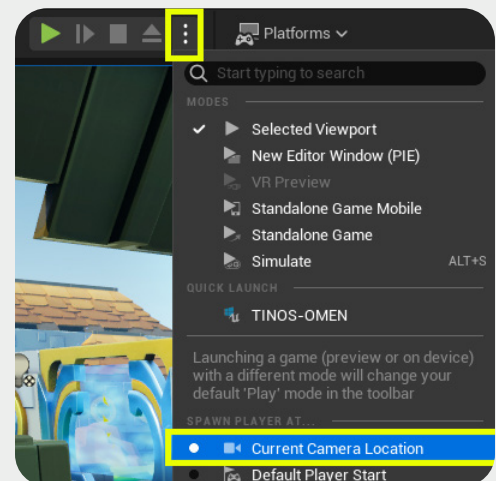


fig d

Let's Play!

If you play the game and reach the door to the large building, you will notice that you require a key to open it. Let's start the game at the door so you can test it out. Click in the Viewport and press the number 5 key to move to the camera 5 bookmark. Make sure the Current Camera Location option is selected in the Play button options and then press Play. Walk up to the door. It should display the text, "Key Needed" and prevent you from opening the door. Stop your gameplay here so we can get into the editor and make some magic happen!

Conditional Statements

A **conditional** statement checks to see if something is **true** or **false**. More commonly they are called **if/then statements** and they are also known as **if/then/else statements**. Simply put, they work like this.

If the **key** has been picked up = **True**

If the **key** has not been picked up = **False**

Within the Blueprint Scripting language these are also known as a **Branch**, the branch node looks like this.

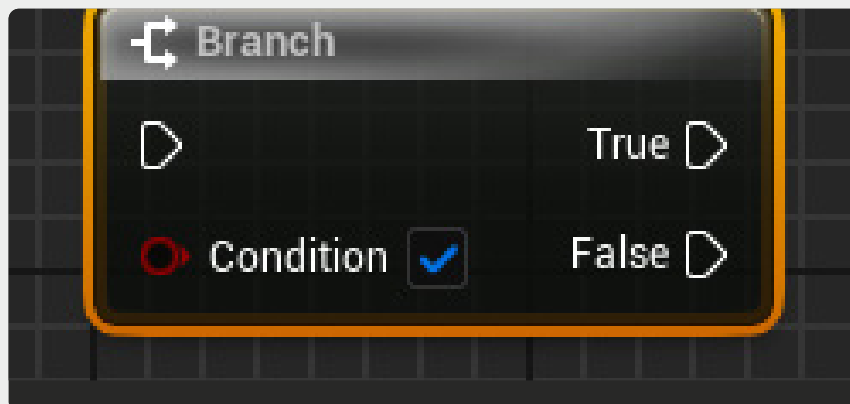


fig 1

What is a Boolean?

In Programming, the Condition can be stored as a **Boolean**, or **bool** for short. The data can be stored in one of two states, it is either **ON** (true) or **OFF** (false). We will use this stored data later in step 14. **Bools** are red, making them easy to see at a glance in your Blueprints.



fig 2

What exactly are Blueprints anyway?

The main thing we will be doing in this level is building the “key” **Blueprint**. You can think of a **Blueprint** as a container that can hold 3D objects as well as code, and that code can talk with various parts of your game.

For this example the key blueprint and the locked door blueprint, will be talking with the game blueprint.

If you need to brush up on **Blueprints**, just skip back to the previous Hour of Code activities. If you feel like you are getting overwhelmed, talk with your peers to troubleshoot as you go along. Game creation is a team effort and should never be done alone. If your peers are asking you for help, be kind, and assist them with the help they ask for. This will help solidify your understanding and ensure they assist you in the future.

Teacher Note

This next section will be very technical, so we advise you to work through it a few times before you help your students. Remember, you can use the BP_key_activity_4_end Blueprint as a reference to help you out.

This next section has 19 steps. Consider what we are trying to accomplish and follow each step closely to understand how we build our solution.

To get an idea of how to hook up a **Boolean**, navigate to the **Content > Hour_of_Code > Blueprints** folder in the **Content Drawer** and open **BP_Door_Locked** by double-clicking on it.

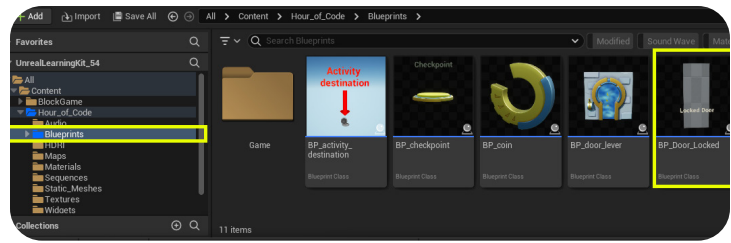


fig 3

Click on the **Event Graph** tab. You will see a yellow comment box area labeled **Activity 4**. Currently, the Target is not connected to the branch. With Blueprints, you can click and drag to connect nodes when building your code. Try it now!

Inside this yellow area simply drag a wire from the **Have Key? Boolean** pin to the **Branch Condition** pin.

The Blueprint will now check the condition, “Does the player have a key?” This can be either True or False. Does that sound simple?

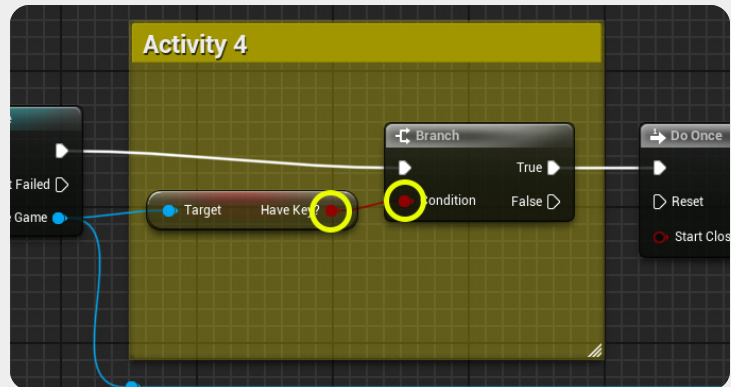


fig 4

Let's create a key from scratch that will open the door.

1. To build a Blueprint Actor from scratch navigate to **Content > Hour_of_Code > Blueprints** folder, and **right-click** in an empty space. Then choose **Blueprint Class**.

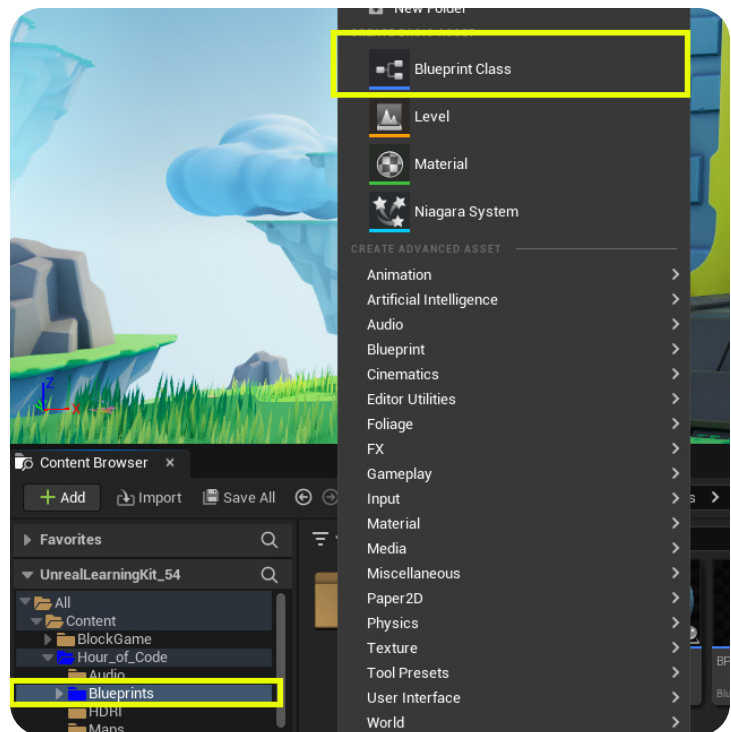


fig 5

2. Select an Actor class from the top of the list.

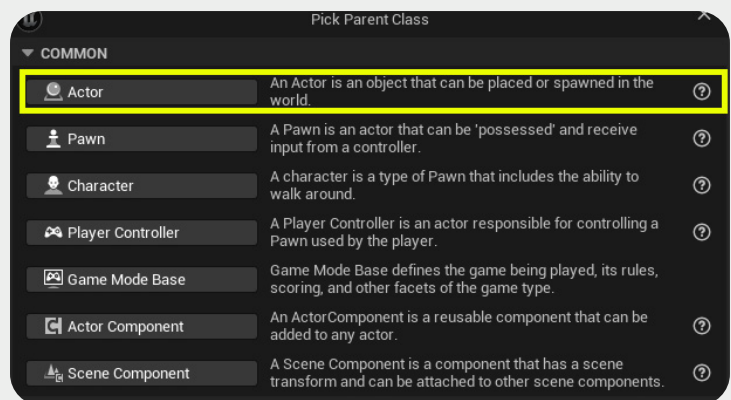


fig 6

3. Name this new blueprint **BP_key**.

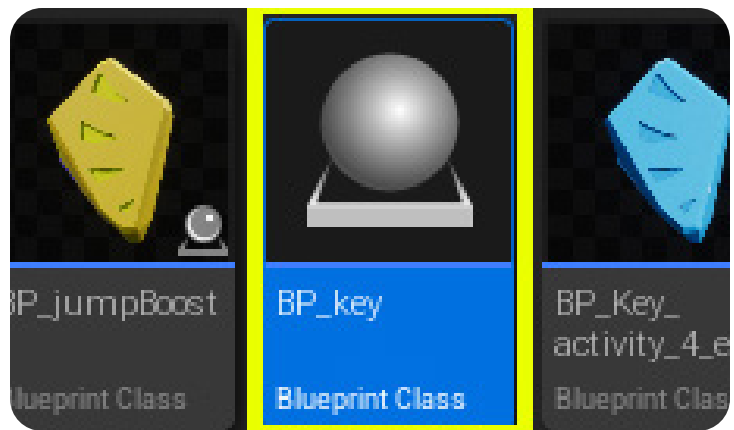


fig 7

4. Double-click **BP_key** to open the Blueprint. Click the **Viewport** tab if it doesn't automatically load. From here, we will be assembling the parts the player will be able to see and interact with.

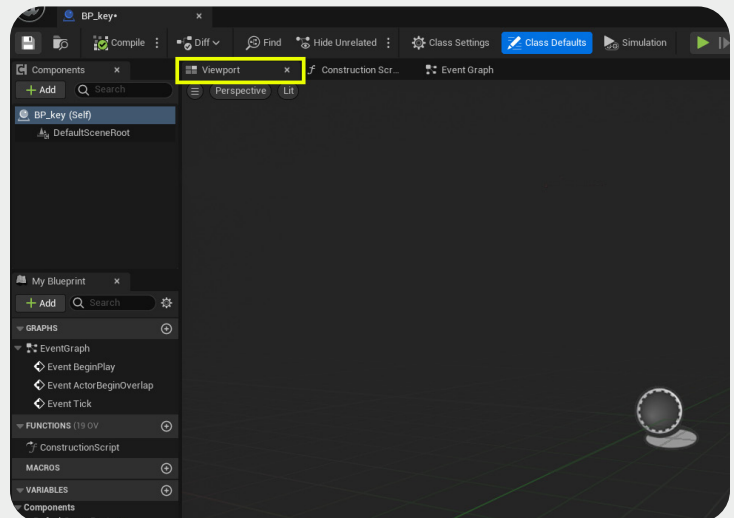


fig 8

5. We will need to add a few **Components** to the viewport, so the player knows what they will be picking up, and so the **Character** has something to interact with. The first piece we will add is a **Collision Sphere Component**. The collision sphere component will define the **hit area** for the key. When the player is in the hit area, it will activate the collision detection. Click the **+Add Component** button at the top left corner of the interface, and search for “**sphere collision**.” Then click the **Sphere Collision** option from the drop-down. You’ll see a wireframe sphere appear in the viewport.

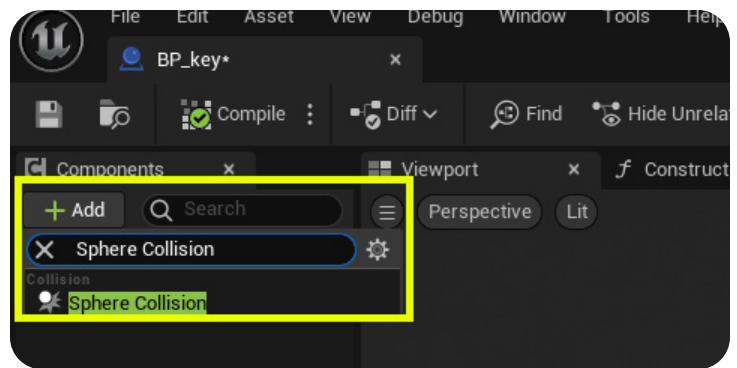


fig 9

6. Then click on the **DefaultSceneRoot** in the components tab, this will ensure the next piece we add doesn't become a child of the **Sphere Collision**.

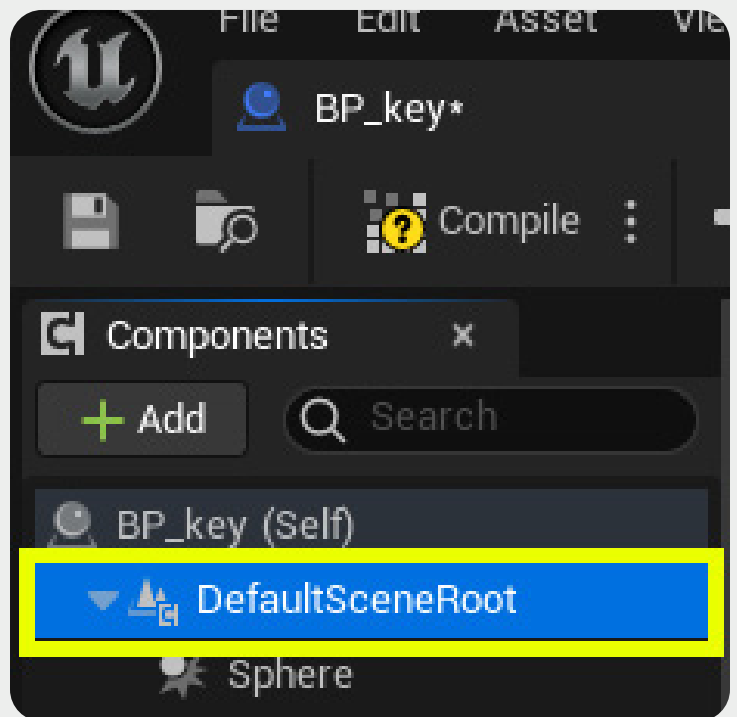


fig 10

Once again, click **Add Component** and search for “**Static Mesh.**” Be careful to choose the **Static Mesh** that is located at the bottom of the list.

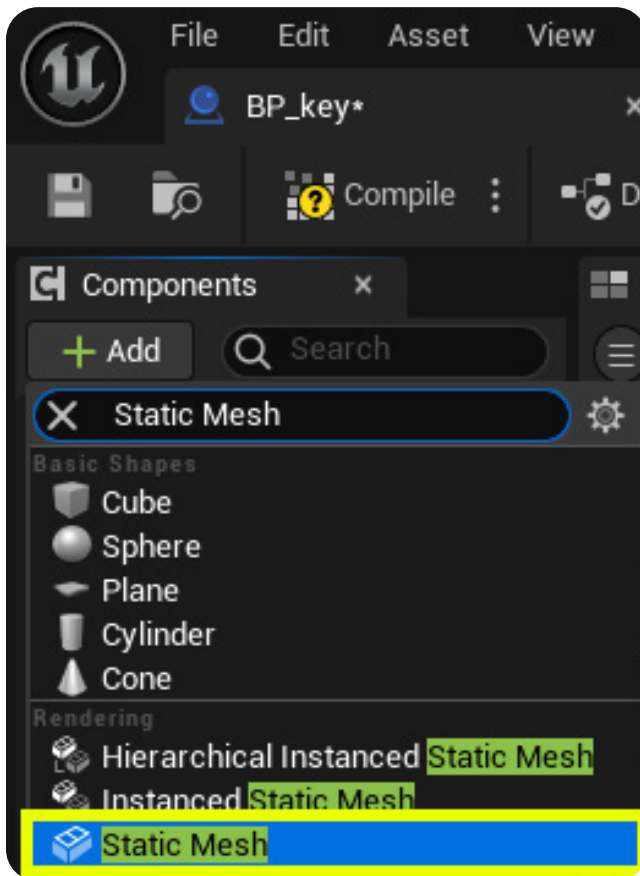


fig 11

Teacher Note

When the student searches for static: mesh, three options will appear. Students might inadvertently select one of the other options at this point, so be sure to check that they choose the correct "Static Mesh" option.

- Now select the Static Mesh in the Components panel. Navigate to the Details panel which is located on the right-hand side of the interface, and find the Static Mesh section. Click the drop-down that says None, and search for **"key"**. Then choose the **SM_key**. You can move the key so it sits in the middle of the sphere if you would like.

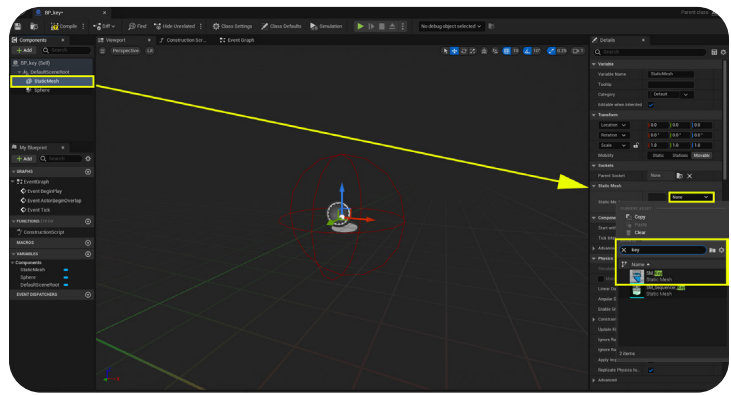


fig 12

- At this point, we should do some housekeeping. It's ALWAYS a good idea to follow best practices that will aid you in the future. By naming our assets it will be easy to keep track of them. Select one in the content panel and press **F2** to rename it. Rename the **Sphere** to **Sphere_coll**, because this is a collision sphere. Then rename the **Static Mesh** to **SM_key**, because it is a key. The Static Mesh (SM) is a 3-dimensional object that does not change shape.

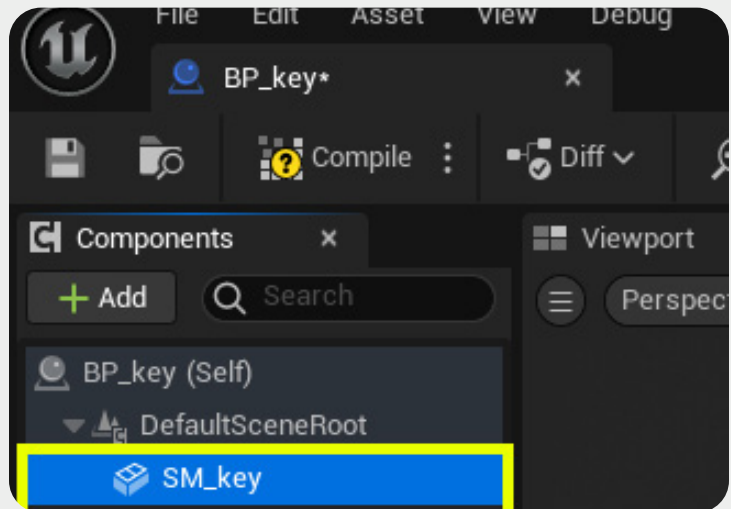


fig 13

9. Let's Save our work by clicking the Save button at the top of the interface.

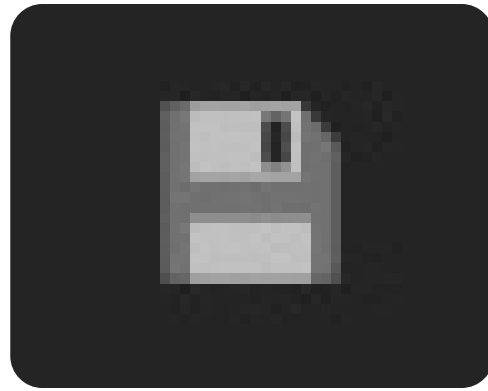


fig 14

Teacher Note

This is a good point to take a moment to double-check students have completed the first 9 steps correctly. From this point forward they will be working in the Event Graph.

10. Click the **Event Graph** tab, this is where we will be scripting the code to make this Blueprint work. You will see 3 nodes in the graph. Select all 3 and press the **Delete** key on the keyboard. We will not need them.

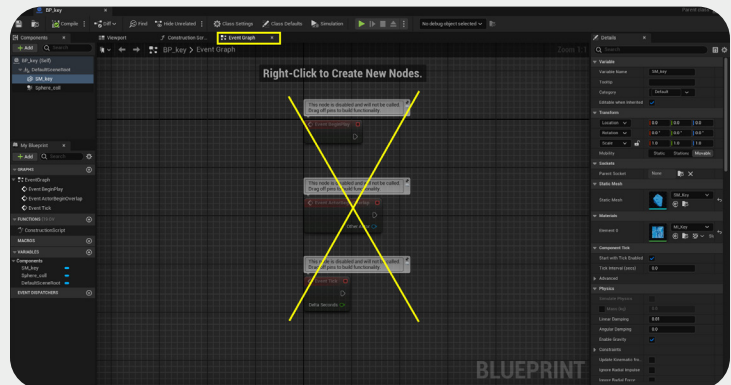


fig 15

11. Select the **Sphere_coll** in the components tab, and scroll to the bottom of the **Details** panel. Click the plus button in the Events section labeled **On Component Begin Overlap**. This will create an Event node that will trigger when the Character touches the **Sphere_coll**. (In other words, this is what will execute when the player picks up the key.)

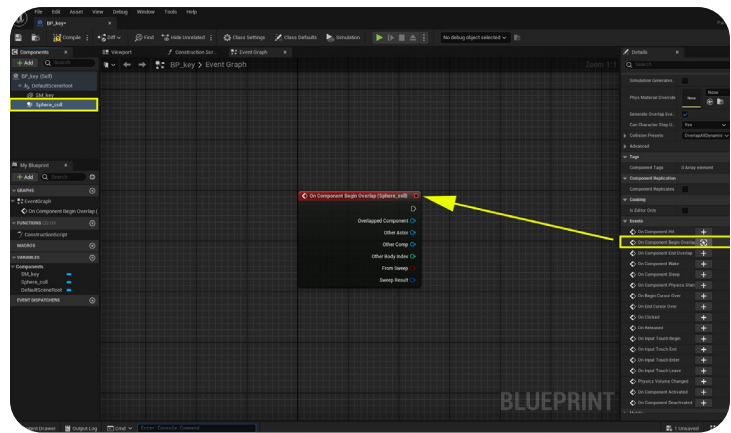


fig 16

12. We need to tell this Blueprint to talk to the game, to accomplish this we need to **Cast** to the game. Let's begin by clicking and dragging a wire from the execution pin in the Event Graph and let go to bring up the **Execution actions**. Type "**cast to BP_HourOfCode_Game**" in the search field. Select **Cast to BP_HourOfCode_Game**, this will create a new node.

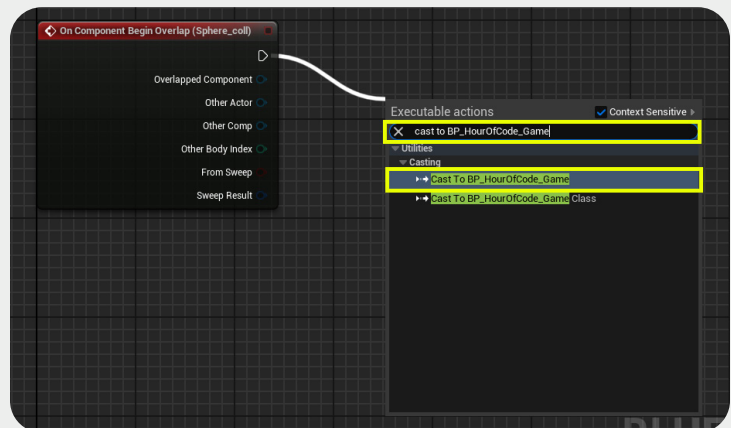


fig 17

Tip

Use the scroll wheel to zoom in or out and click-and-drag the right mouse button to move your view.

13. Drag a wire from the **Object** pin and search for “get game mode”. Choose **Get Game Mode**, this will create another new node.

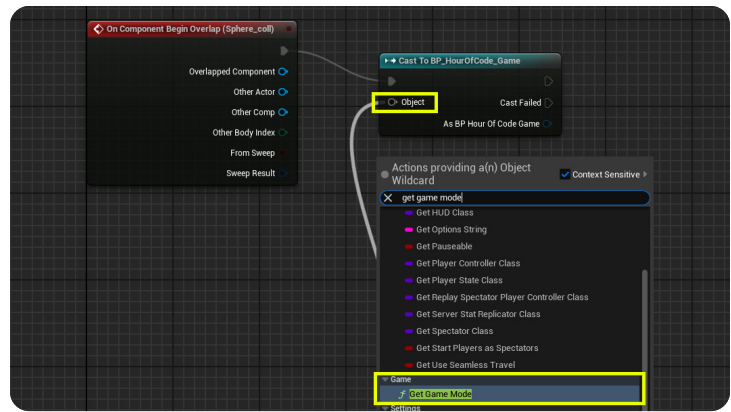


fig 18

14. Now that this Blueprint is talking to the game, the game needs to know what to do. We are going to tell the game to store that the key has been picked up and is in the player's inventory. To achieve this, pull a wire from the bottom blue pin **As BP_HourOfCode_Game** from **Cast to BP_HourOfCode_Game** node and search “set have key.” Choose **Set Have Key?** Choose **Set Have Key?**

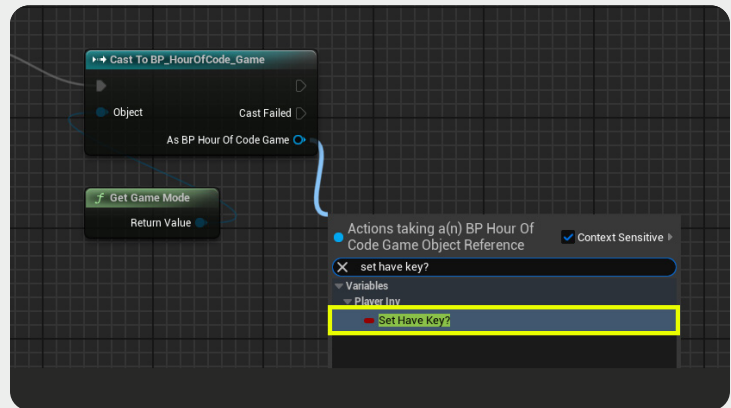


fig 19

15. Connect the execution pins from **Cast to BP_HourOfCode_Game** to the SET node (see below), and toggle the checkbox **ON**, because we want to **set** this **Boolean** to **true**.

The question we are asking with this code is “Does the player have the key?”. We are setting the answer to yes (**true**) with this **boolean** node.

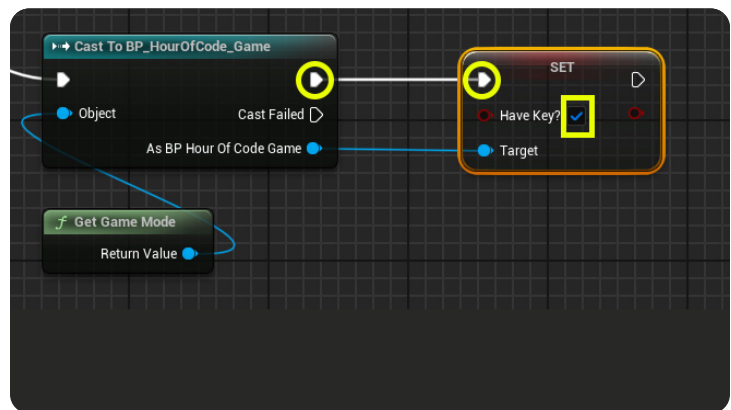


fig 20

16. Let's add a sound so the player knows they have picked up the key. Pull off the execution pin from SET and search "play sound" and choose **Play Sound 2D**.

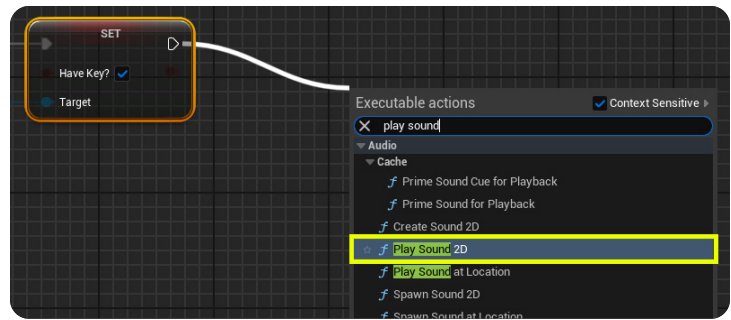


fig 21

17. We need to choose a sound to play. Click the Select Asset drop-down, search "key" and choose **SFX_key**.

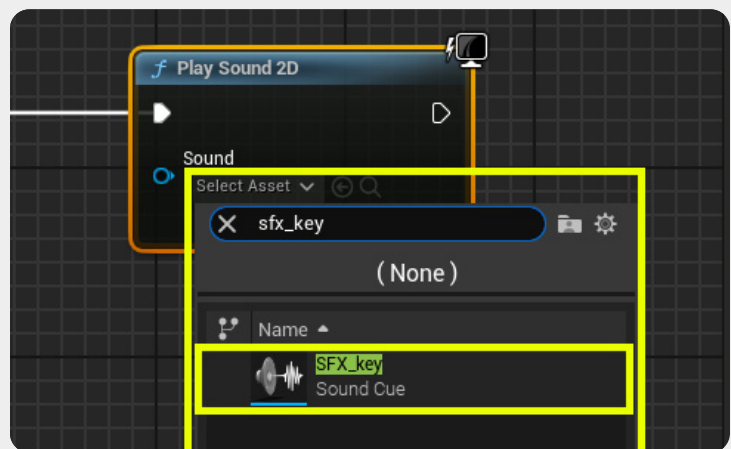


fig 22

18. The last node we need to add, will tell the Blueprint to destroy itself. After all, the character has touched the key to collect it, therefore it does not need to be in the level anymore. Drag a wire from the execution pin of Play Sound 2D and type "**destroy actor**". Choose **Destroy Actor**.

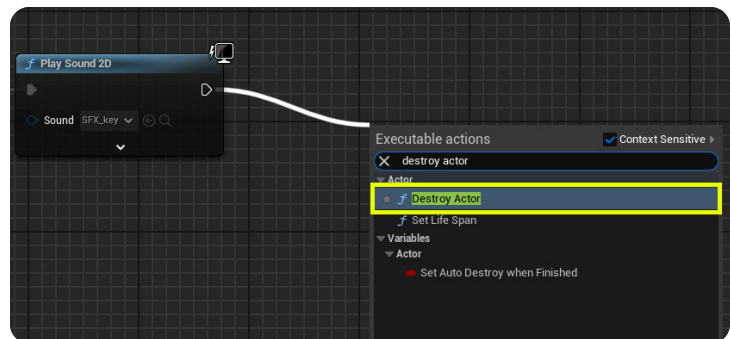


fig 23

19. To complete this we will need to **Compile** the code and Save all the work we have completed. When you click the Compile button, the “?” should change to a green checkmark.

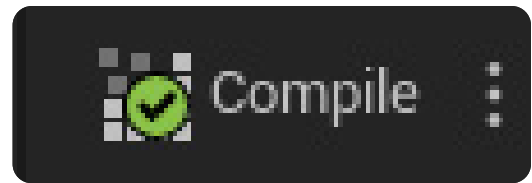


fig 24

Take a look at the image below and cross-reference it with your work.

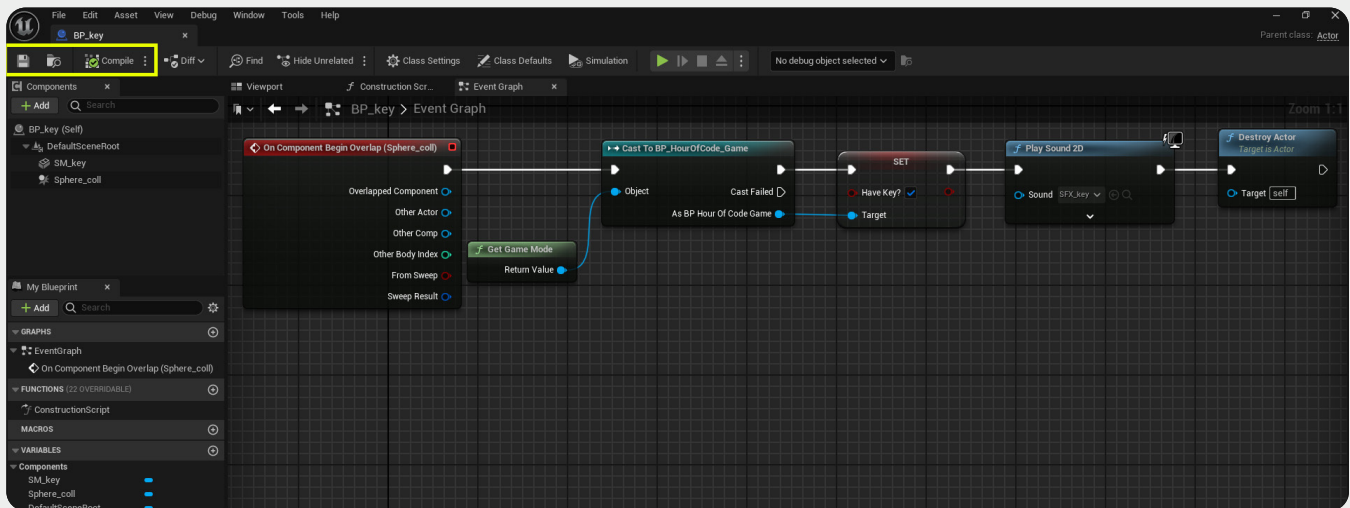


fig 25

Teacher Note

At this point, we will start play-testing. Since we set a lot of variables, there will be a few things we need to test. Here is a list of some of the checks to prepare for.

- Be sure the cast node is casting to the GAME, not the CHARACTER
- The set node should be toggled on
- Any speakers should be turned on and not muted
- A key icon should appear on the bottom left-hand side of the screen. This is a feature that we will address in activity 5.

Now, it's time to playtest your Blueprint.

Make sure you have compiled and saved your Blueprint and then click the X in the upper-right corner to close the Blueprint editor. (Make sure you are closing the window with the Blueprint editor, so you don't accidentally close your entire project.)

Now, you should be back to your level editor. Click in the Viewport and press the number 5 to jump to camera bookmark 5. In the **Content Drawer**, navigate to **Content > Hour_of_Code > Blueprints**. Drag a copy of your **BP_key** into your level next to the door on the final island. Press W to activate the Move gizmo. Drag the blue up arrow to position the key floating above the ground.

Press the Play button to test your key.

To fully test your key, DO NOT walk over it as soon as you start playing the game.

First, walk up to the door, and you will see a message that tells the player "Key Needed". This is because you have yet to pick up the key.

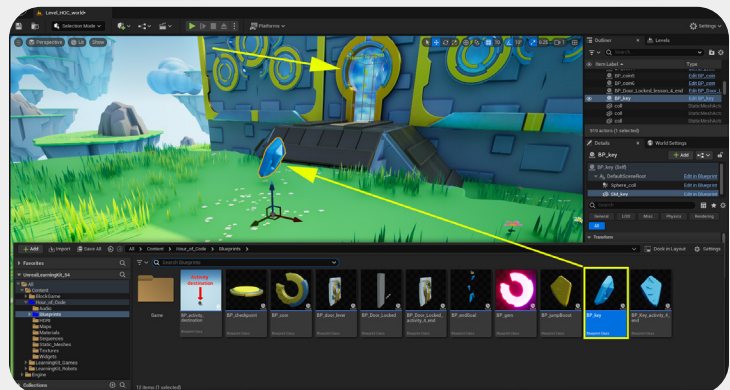


fig 26

Second, pick up the key. You should hear a metallic key sound, and the key will disappear.

NOTE: Be sure your speakers are working correctly.

Next, walk up to the door. The "Key Needed" message should **NOT** show up on the screen.



fig 27

Last, press the **E** key on your keyboard and the door will open, and a key icon should show up on the bottom left-hand side of the screen. Don't worry about this icon, it's just a hint of what we will be covering in Activity 5.

Now that the door is open, we have one last task. We need to add the end goal. Inside the **Blueprints** folder, you will find **BP_endGoal**. Drag it into your level to the top of the ramp at the back of the building.

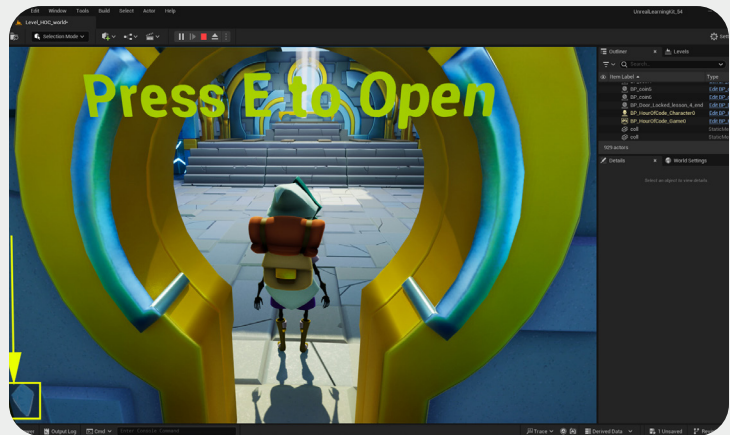


fig 28

Teacher Note

This would be a good time to make sure all students have gotten the door to successfully open when they collected the key and press E at the door.

With the goal in place, you can play your game from beginning to end. You'll notice that once you touch the end goal the player is rewarded with various stats, such as how many coins and gems they collected, in addition to how long it took to complete the level.

To play your game from the beginning, click the dropdown arrow on the **Play** button and select the **Default Player Start** option. Now, clicking the **Play** button should start you at the beginning.

Remember to **Save All** your work.

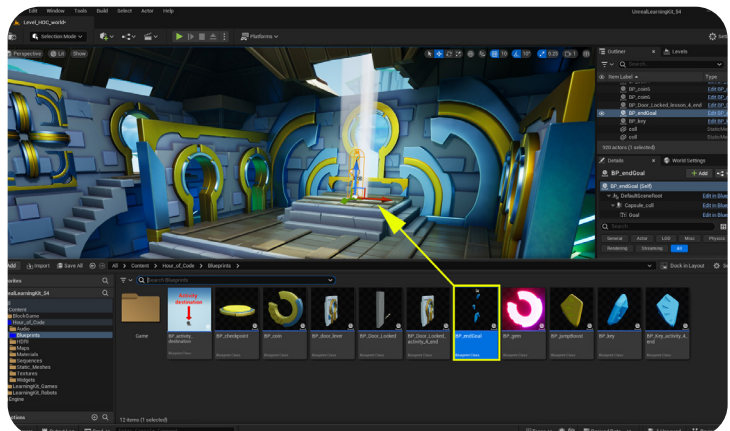


fig 29

Game Design Challenge

Now that you have a working game, try adding more coins and moving the key to a better location. Can you make the game more interesting and challenging for players? Have some people test your new game and give you feedback.

Up for a challenge?

Now that you have had a chance to see how **Booleans** work, open the **BP_Door_Locked_activity_4_end** blueprint from the **Content > Hour_of_Code > Blueprints** folder in the **Content Drawer**. You will find quite a few **Boolean** nodes throughout this Blueprint that have been marked in red. Can you find where the door is looking to see if the player has a key? How about the section that tells the key icon to show up on the screen?

In our final Hour of Code activity, we will cover how to make various sections of the heads up display (HUD) visible.

Both the key icon you saw earlier, and the end game screen are part of the HUD. We will also package the game so you can send it to other people to play or add it to your portfolio when looking for jobs.

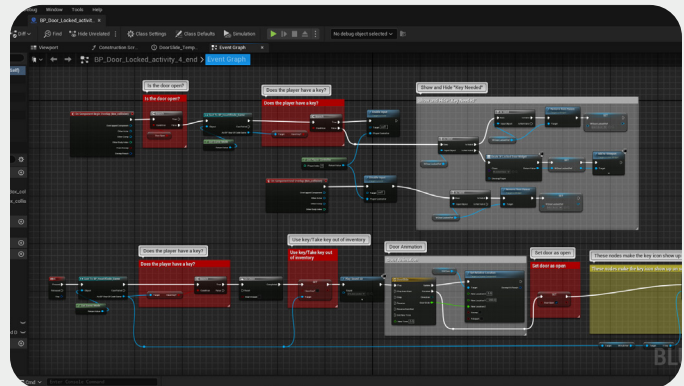


fig 30