# Create with VR

## Scope & Sequence

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In the *Create with VR* course, students learn to design and develop their own Virtual Reality (VR) applications. They will create **prototypes**, attempt **challenges**, and complete **quizzes** to build and solidify their skill set. At the same time, they will be guided through creating their own **unique VR project** from start to finish, beginning with a blank design document and ending with a fully functional project. Whether they want to create an interactive walkthrough of an ancient ruin, a product configurator for a car manufacturer, a simulator for operating dangerous machinery, or any other experience, the *Create with VR* course will help them bring those ideas to life in VR.

## Table of Contents

# Before you begin - Tech Setup

| TUTORIAL SCOPE | |
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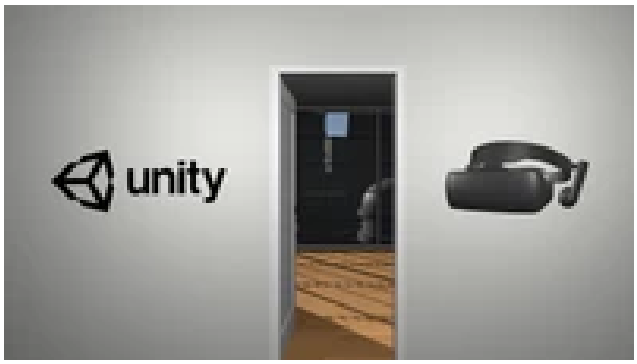
| In this unit, you will set up your computer and your VR headset so that they are ready to begin VR development. In these tutorials, you will:<br>• Install the correct version of Unity, including any required export modules.<br>• Configure your device for testing and development, including downloading any additional required software. |  |

| TUTORIAL SEQUENCE | |
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| **Lesson 0.1**<br>Set up Unity and your VR device | In this lesson, you will get all the necessary software for your computer and VR device required for VR development. First, you will install the recommended version of Unity to be able to follow along with this course. Depending on which VR device you intend to use, you may also need to install additional export modules.<br>You will also make sure your VR headset is configured properly for development and testing, including downloading additional device-specific software. |

# Unit 1 - VR Basics

| UNIT SCOPE | |
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| In this unit, you will learn the basics of setting up a VR project and implementing simple interactivity.<br>In these tutorials, you will:<br>• Set up a VR-ready project with the room of your choice<br>• Implement locomotion so that users can move around the scene<br>• Add grabbable objects users can pick up and throw around<br>• Set up sockets that objects can snap into<br><br>In the challenge for this unit, you will apply your skills in an architectural review prototype. Then, in the Lab, you'll fill out a design document to lay out a concept for your own project, and then begin working on it. Finally, in the quiz, you will test your new knowledge. |  |

| UNIT SEQUENCE | |
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| **Lesson 1.1** VR Project Setup | In this lesson, you will learn how to set up a project for VR development. By the end of this lesson, you will be able to experience your empty room in VR. |
| **Lesson 1.2** VR Locomotion | In this lesson, you will learn how to implement various types of locomotion in VR. By the end of this lesson, the user will be able to teleport around your newly furnished room to admire it from all angles. |
| **Lesson 1.3** Grabbable objects | In this lesson, you will learn how to configure objects for basic grabbable interactivity in VR. By the end of this lesson, users will be able to pick up objects in the scene and throw them around. |
| **Lesson 1.4** Sockets | In this lesson, you will learn how to configure sockets that objects can snap into in VR. By the end of this lesson, users will be able to hang hats up on hooks - and even wear the hats too! |
| **Quiz** | In this quiz, you will review the knowledge and skills you learned in Unit 1 related to VR Basics. |
| **Challenge 1** Architecture Review App | In this challenge, you'll apply the skills you learned while making your VR Room in an Architecture review app. In this prototype, the user can examine a building at real-world scale, inspect a miniature 3d model and floor plan of that building, and even use a ruler to take measurements as they look around. |
| **Lab 1** VR Personal Project | In this first lab, you'll fill out a design document to lay out your concept, and then set up a basic VR scene using simple primitive shapes. |

# Unit 2 - Events and Interactions

**UNIT SCOPE**

In this unit, you will implement more complex interactions in VR based to make the experience more immersive.
In these tutorials, you will:

- Implement audio and haptic feedback
- Apply new functionality to specific objects
- Allow the user to toggle between multiple types of interactors
- Add user interfaces to the world

In the challenge for this unit, you will apply your skills in a 3D painting prototype. Then, in the Lab, you'll implement the core functionality of your personal project. Finally, in the quiz, you will test your new knowledge.

**UNIT SEQUENCE**

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| **Lesson 2.1** Audio and Haptics | In this lesson, you will learn how to increase the immersion of your project through touch and audio stimuli. By the end of this lesson, the user will receive haptic and auditory feedback when they hover over or grab an object. There will also be 3D spatial ambient sound in the scene. |
| **Lesson 2.2** Activation Events | In this lesson, you will learn how to implement various types of locomotion in VR. In this lesson, you will learn how to add unique functionality to an object when the user interacts with it in a certain way. By the end of this lesson, users will be able to pick up a remote and press a button on a controller to turn on a TV. |
| **Lesson 2.3** Direct and Ray Interactors | In this lesson, you will learn how to implement Direct Interactors and how to switch between interactors on the same controller. By the end of this lesson, the user will be able to grab things directly with their hands and then toggle a ray to point at things when they need to. |
| **Lesson 2.4** User Interfaces | In this lesson, you will learn how to implement world space user interfaces in VR. By the end of this lesson, the user will be greeted by a welcome screen that provides basic instructions. They will also be able to bring up a simple reset menu that allows them to reload the scene. |
| **Quiz 2** | In this quiz, you will test the knowledge and skills you learned in Unit 1 related to VR Basics. |
| **Challenge 2** 3D Painting App | In this challenge, you'll apply the skills you learned while making your VR Room in a 3D painting app. In this app, the user can choose the shape they want to paint on, select the color and size of their brush on a handheld palette, and then create their masterpiece! |
| **Lab 2** | By the end of this lab, your personal project will have most of its core functionality. |

# Unit 3 - VR Ergonomics and Optimization

**UNIT SCOPE**

In this unit, you will focus on ergonomics and optimization for  VR in order to make your app as accessible and comfortable as possible.
In these tutorials, you will:

- Improve comfort and accessibility
- Evaluate key performance metrics
- Implement optimized baked lighting
- Configure and build your app for sharing

In the challenge for this unit, you will apply your skills in an industrial training simulation prototype. Then, in the Lab, you'll implement the core

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| functionality of your personal project. Finally, in the quiz, you will test your new knowledge. | |
| **UNIT SEQUENCE** | |
| **Lesson 3.1** Comfort and Accessibility | In this lesson, you will learn how to reduce the risk of simulator sickness and increase the inclusivity of your app, allowing it to be enjoyed by as many people as possible. By the end of this lesson, your app will be more comfortable and accessible. |
| **Lesson 3.2** Optimization | In this lesson, you will learn about each of the key performance metrics for VR (fps, polycount, and draw calls) and how to ensure these metrics are optimized. By the end of this lesson, your app will be more optimized for performance. |
| **Lesson 3.3** Lighting | In this lesson, you will learn how to use light modes, lightmapping, and light probes to optimize the lighting for VR. By the end of this lesson, the lighting in your scene will be both beautiful and performant. |
| **Lesson 3.4** Building and Sharing | In this lesson, you will follow guidelines for best practices and explore options for sharing your work. By the end of this lesson, you'll configure your app appropriately and build a version of it that is ready to share. |
| **Quiz 3** | In this quiz, you will test the knowledge and skills you learned in Unit 3 related to VR Lighting and Optimization. |
| **Challenge 3** Training Simulation app | In this challenge, you'll apply the skills you learned while making your VR Room in an industrial training simulation. In this app, using buttons, knobs, levers, and joysticks, the user has to collect crates dropped into the factory and stack them on a nearby platform. |
| **Lab 3** Personal Project Optimization and Lighting | By the end of this lab, your personal project will be filled with beautiful art, optimized for performance, and ready to share. |

# Next Steps

| SECTION SCOPE | |
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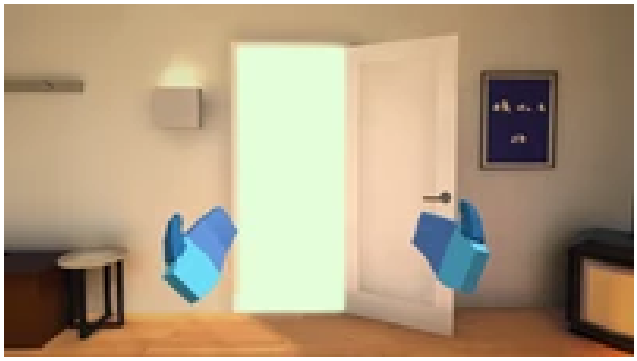
| In this section, you will be provided with potential next steps, now that you have completed this course. Whether you are more interested in art or programming, there is so much more you can learn to take your skills to the next level and create even more custom, unique VR experiences.<br><br>If you have completed either the Unity Certified User: Programmer exam or the Unity Certified User: Artist exam, you are also eligible to take the Unity Certified User: VR Developer exam. |  |

| SECTION SEQUENCE | |
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| Continue working on your Personal Project | Maybe the most effective way to gain new VR development skills is actually building something new in VR. Luckily, you already have a personal project in development, which is the ideal opportunity for you to expand your skills.<br><br>Dream up some new ambitious features for your personal project and try to implement them. As you do this, not only will you improve the project that you can share and add to your portfolio, you will also very quickly take your VR skills to the next level.<br><br>As you continue developing your project, please share it with the Unity community! We'd love to see what you're working on. |
| Learn more about Programming for VR | In this course, you used the default behaviors included in the XR Interaction Toolkit and some pre-built scripts that were provided to you in the course. However, if you want to continue developing unique interactions in VR, especially if you are interested in doing VR development professionally, you should be comfortable programming and debugging custom VR interactions.<br><br>**1. Solidify your programming fundamentals:**<br>If you are not already confident with your programming, you may find programming for VR somewhat challenging since it is a rapidly evolving technology with more limited documentation. For that reason, it is recommended that you start with the Junior Programmer Pathway, which will give you the foundational skills needed to jump-start your VR development.<br><br>**2. Implement some VR-specific functionality:**<br>Once you are already comfortable with programming, you should attempt to follow some VR development tutorials to apply your programming skills to custom VR interactions. We highly recommend the VR with Andrew YouTube channel.<br><br>**3. Get comfortable with the Profiler:** |

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| | Since performance is so critical for VR, it is important for any VR developer to be comfortable using the Profiler window. This is a very complex tool, which allows you to pinpoint things like how your code, assets, scene settings, camera rendering, and build settings affect your application's performance.<br><br>If you are interested in getting an entry-level job doing development for VR, what's most important is a portfolio showcasing your experience developing custom VR interactions. As you expand your skills, develop small prototypes that you can share with potential employers or institutions. |
| Learn more about Art for VR | In this course, all of the art assets and environments were pre-built for you, optimized for performance on mobile VR headsets. If you want to create environments in VR that are completely your own or to get a job creating art for a VR project, there is a lot more you can learn to build your skills.<br><br>**1. Understand the Universal Render Pipeline:**<br>The Universal Render Pipeline (URP) provides artist-friendly workflows that let you quickly and easily create optimized graphics across a range of platforms, from mobile to high-end consoles and PCs. For this reason, it is incredibly useful for VR development, where you will be developing for devices with a wide range of processing power.<br><br>**2. Develop Low Poly assets:**<br>Since performance is so critical in VR, it is important that you are comfortable developing nice, low poly assets that will perform well on mobile VR headsets.<br><br>**3. Create custom materials and shaders:**<br>You did briefly explore materials and shaders in this course, but if you are going to develop your own custom VR art, it's important that you can develop your own materials and shaders that are optimized for VR.<br>● Resource?<br><br>**4. Learn more about lighting:**<br>You learned some of the basics for optimized lighting in this course, but that was only the surface of a very deep and complex topic. It is recommended that you explore lighting more thoroughly to be able to achieve desired lighting in the most performant way possible.<br>● Resource?<br><br>These are just some of the most important skills for art in VR. As you actually attempt to implement your art into VR environments, you will learn additional critical skills in the VR art pipeline. |
| Take the VR Developer certification exam | If you have already earned the Unity Certified User: Programmer or the Unity Certified User: Artist certification, you are eligible to take the The Unity Certified User VR Developer certification exam. You can find the objectives for the exams here. |

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| | This certification can be used to prove to potential employers or educational institutions that you are capable of developing VR experiences. It tests your ability to create VR experiences in Unity and assumes you have accumulated about 200 hours of experience with Unity.<br><br>If you completed the entirety of this course, you should be able to pass this exam. However, if you want to ensure you are ready for it, there is additional courseware you can purchase to help with your preparation. |
| Submission: Show us what you're working on | If you have continued to develop your personal project, developed new prototypes, or created custom art for VR, please share it with us here.<br>Take screenshots, videos, or post links of what you're working on! |