

# Change Your Perspective

## Understanding Virtual Reality

Name: \_\_\_\_\_

### What is reality?

Our perception of reality comes through our five senses: *taste*, *touch*, *smell*, *sight*, and *sound*. Although our senses appear to operate independently of one another, in reality they collaborate closely to enable our brain to interpret what we see, hear, smell, touch, and taste to understand our surroundings.

### What is virtual reality?

*Virtual reality (VR)* is an interactive, computer-generated simulation that creates a three-dimensional environment that can be experienced in a real or physical way by a person using specialized equipment (figure 1). VR uses *sensory feedback* (i.e. information collected from your five senses) to trick your brain into thinking two-dimensional images, videos, or games are actually three-dimensional. Sitting at the intersection of biology, physics, and computer science, VR has the ability to change how we see and feel!



Figure 1. A deconstructed VR headset.

### What is the evolution of virtual reality?

The ability to create 3-D images is not a new idea. In fact, modern virtual reality technologies build upon ideas that date back to the 1800s. Early attempts at creating 3-D environments included paintings, stereoscopes (figure 2), and anaglyphs (figure 3). In more recent years, virtual reality headsets have been developed. These headsets come equipped with lenses, as well as motion detectors to track the users eye movement to trick the brain into thinking it is somewhere else. Utilizing this technology, a person can be transferred to the jungle, the ocean, or even outer space from their own living room.



Figure 2. An old Zeiss pocket stereoscope with original test image.

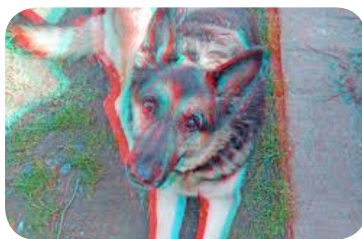


Figure 3. A pair of glasses, with filters of opposing colors, can make a fuzzy anaglyph jump off the page.

A **stereoscope** is a device that takes two photos of the same object captured at slightly different angles and views the photos together to create a 3D image.

An **anaglyph** is a photo of two overlapping images of the same object that are printed in different colors (red and cyan). This creates a 3D effect when the anaglyph is viewed through colored filters

**BRAINSTORM!** What are some practical uses for virtual reality? Write your ideas in this box:



## PART I — The Virtual Reality Environment

When creating a virtual environment, engineers use the same concepts that govern our perception of the world. By understanding the science of **sensory feedback**, they are able to develop technology that can change the way we interpret the world.

Modern virtual reality manipulates two of our five senses: **sight** and **sound**. Using lenses and **stereoscopic** (two- input) vision (aka depth perception), virtual reality headsets can create an artificial 3-D environment.

Modern VR headsets use **Fresnel** lenses, a lightweight lens that changes the **refraction** (i.e. bending) of light. As the newly bent light reaches the eye, it creates the perception that the image is further away than it actually is. This is the same concept used in glasses to help treat people with nearsightedness and farsightedness.

Stereoscopic, or binocular, vision is when the two views seen from your eyes are interpreted by your brain as one image having depth. Each eye takes in a different, but overlapping image. The brain uses the differences between these two images to create a 3-D world. Stereoscopic vision has been essential in the evolution of animals, such as birds of prey, which use it to see their prey from high in the sky.

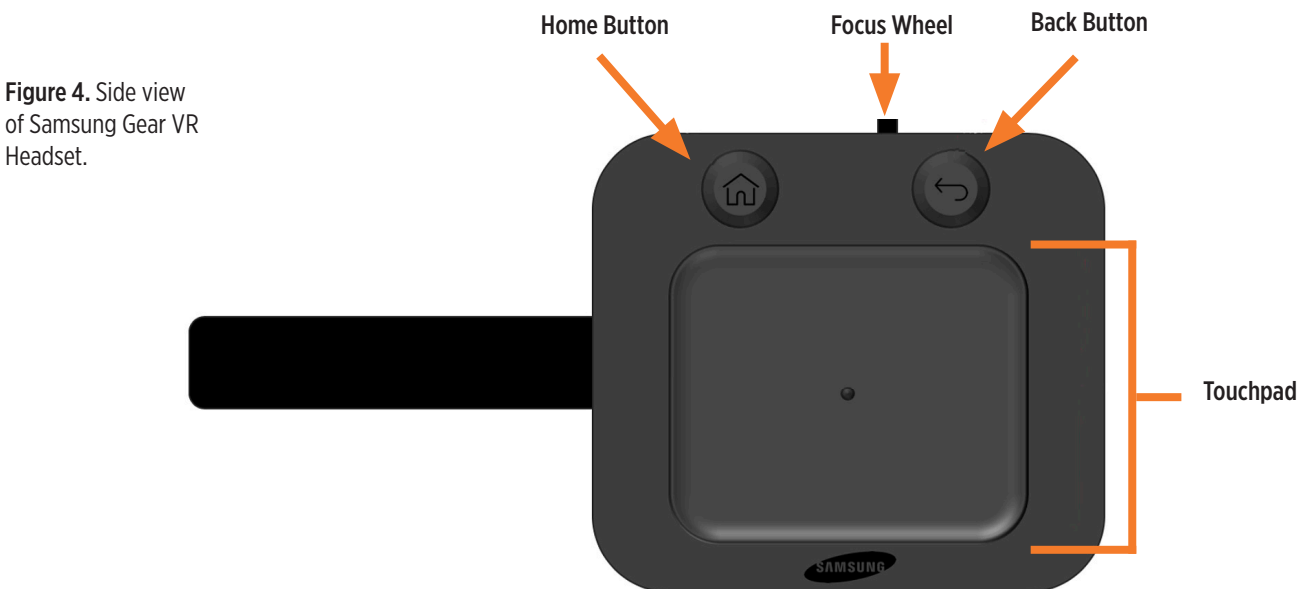
Virtual reality headsets have the added feature of motion sensing. Inside the phone or headset, is a sensor that can detect where a person's head is moving. This data is then sent to the software to determine where the user is looking and to create a sense of movement through the artificial 3-D environment.



**BRAINSTORM:** Identify three different careers that would be needed to create a VR headset.

- 1.
- 2.
- 3.

Now we are going to travel into a virtual world to see how it manipulates our perception of reality.



**Figure 4.** Side view of Samsung Gear VR Headset.

## Instructions

1. Unlock the phone by swiping up on the screen.
2. Swipe right until you see the Oculus VR app and click to open the app.
3. Once in the app, on the bottom of the screen, select Library.
4. When on the Library tab, select “Welcome to Virtual Reality.”
5. Plug the headphones into the phone.
6. Insert the phone into the VR Headset: connect the charging port of the phone to the micro-USB extension on the VR headset. Make sure the phone is secured in the headset before proceeding!
7. Put the headset and earphones on.
8. If the image you see is blurry, turn and adjust the focus wheel on the top of the headset to create a clear image.
9. Move your head to direct the white line of light on the screen to land on START and then tap the touchpad (located on the right side of your headset) to select START.
10. Sit back, relax, and enjoy the VR experience!

Describe how your senses of vision, motion, and space were altered during virtual reality.

## PART II — Creating your own virtual world

Think back to some of the practical uses of virtual reality you brainstormed earlier. What were they? Why would they be good uses for virtual reality?

Virtual reality technology has enormous potential to change the future for many different fields, from medicine, business, and space/ocean exploration to gaming, cinema, and military training.

Now it's time for you to put your creativity skills to the test!

**Objective:** create a 360-degree photograph using Google Cardboard Camera which can be used to create a virtual environment

First, let's try out Google Cardboard!

1. Remove the phone from the VR headset.
2. Return to the home screen of the phone by clicking on the middle button.
3. Swipe right until you find the app “Cardboard Camera”.
4. Select the Shared with You tab and choose a sample photo.
5. Press the orange start button and place the phone into the cardboard viewer (*instructions shown on the cardboard viewer*).

**Describe how this experience is different from your experience in Part I. How were your senses of vision, motion, and space altered?**

***Create your own VR experience!***

In this activity, you will be creating a VR experience based on a prompt given to you by your Learning Undeclared instructor.

**Break into groups of 2 – 4.**

- 1. Take 5 minutes to read your prompt with your group and come up with the landscape/environment you will photograph for your given scenario.

**KEEP IN MIND:**

The Cardboard Camera also records sound, so be creative with your landscape!

- 2. When you have your scenario planned out, remove the phone from the Google Cardboard and close out the image to return to camera screen.
- 3. Select your photos and hit the orange camera on the bottom right of the screen.
- 4. When you are ready to record, hit the orange play button.
- 5. Take a photo of your landscape by very slowly turning 360 degrees, keeping the arrow along the line.
- 6. When you are done with your photograph, open the “your photos” tab and select your photo.
- 7. Press the orange viewer button and put the phone into the Google cardboard viewer and see your virtual space.
- 8. After you view your photograph, trade phones with the group next to you and view their virtual photograph. Try to guess what their prompt asked them to do and have them guess for yours!

## Prompt A: Psychology

**Scenario:** Create a virtual reality landscape for...


Your group is a team of psychologists trying to help your patient overcome their fear of public speaking. Create a virtual reality (VR) landscape that will help your patient by taking a photo using the phone and Cardboard Camera app (refer to steps 5 – 10 on the handout). Keep in mind that the Google Cardboard camera can record both image and sound.

**Plan it out:** Write out some ideas for your VR landscape below.

**Perform it!** Refer to steps 5 – 10 in Part II on the handout to record your VR landscape.

**Explain your reasoning:** How would this VR landscape work? Why would it work? Write your reasoning below.

**In practice:** As a group, answer the questions below.

 How else can VR be useful for the field of psychology?

 How would you improve upon VR technology?

**Time to share:** Swap your VR landscape to another group! Ask them to guess what you're trying to do...did they get it?

## Prompt B: Entomology

**Scenario:** Create a virtual reality landscape for...


Your group is a team of entomologist trying to better understand the natural habitat of an ant. Create a virtual reality (VR) landscape that will help your team by taking a photo using the phone and Cardboard Camera app (refer to steps 5 – 10 on the handout). Keep in mind that the Google Cardboard camera can record both image and sound.

**Plan it out:** Write out some ideas for your VR landscape below.

**Perform it!** Refer to steps 5 – 10 in Part II on the handout to record your VR landscape.

**Explain your reasoning:** How would this VR landscape work? Why would it work? Write your reasoning below.

**In practice:** As a group, answer the questions below.

 How else can VR be useful for the field of entomology?

 How would you improve upon VR technology?

**Time to share:** Swap your VR landscape to another group! Ask them to guess what you're trying to do...did they get it?

## Prompt C: Retail

**Scenario:** Create a virtual reality landscape for...

Your group is a team of managers at a local store trying to create a training program for new employees. Create a virtual reality (VR) landscape that will help train new employees by taking a photo using the phone and Cardboard Camera app (refer to steps 5 – 10 on the handout). Keep in mind that the Google Cardboard camera can record both image and sound.

**Plan it out:** Write out some ideas for your VR landscape below.

**Perform it!** Refer to steps 5 – 10 in Part II on the handout to record your VR landscape.

**Explain your reasoning:** How would this VR landscape work? Why would it work? Write your reasoning below.

**In practice:** As a group, answer the questions below.

❓ How else can VR be useful for the field of retail?

❓ How would you improve upon VR technology?

**Time to share:** Swap your VR landscape to another group! Ask them to guess what you're trying to do...did they get it?

## Prompt D: Real Estate

**Scenario:** Create a virtual reality landscape for...

Your group is a team of real estate agents trying to sell a million-dollar property to clients that are overseas. Create a virtual reality (VR) landscape that will help you sell this expensive property to someone that is in a different location by taking a photo using the phone and Cardboard Camera app (refer to steps 5–10 on the handout). Keep in mind that the Google Cardboard camera can record both image and sound.

**Plan it out:** Write out some ideas for your VR landscape below.

**Perform it!** Refer to steps 5 – 10 in Part II on the handout to record your VR landscape.

**Explain your reasoning:** How would this VR landscape work? Why would it work? Write your reasoning below.

**In practice:** As a group, answer the questions below.

❓ How else can VR be useful for the real estate industry?

❓ How would you improve upon VR technology?

**Time to share:** Swap your VR landscape to another group! Ask them to guess what you're trying to do...did they get it?



## Prompt E: Tourism

**Scenario:** Create a virtual reality landscape for...


Your group is a team of government officials from the Department of Tourism interested in attracting new tourists to your town. Create a virtual reality (VR) landscape that will attract new people to vacation in your town by taking a photo using the phone and Cardboard Camera app (refer to steps 5 – 10 on the handout). Keep in mind that the Google Cardboard camera can record both image and sound.

**Plan it out:** Write out some ideas for your VR landscape below.

**Perform it!** Refer to steps 5 – 10 in Part II on the handout to record your VR landscape.

**Explain your reasoning:** How would this VR landscape work? Why would it work? Write your reasoning below.

**In practice:** As a group, answer the questions below.

 How else can VR be useful for the tourism industry?

 How would you improve upon VR technology?

**Time to share:** Swap your VR landscape to another group! Ask them to guess what you're trying to do...did they get it?

## Prompt F: Criminal Justice

**Scenario:** Create a virtual reality landscape for...


Your group is a part of a remote S.W.A.T. team trying to help the police force on the ground navigate a hostage situation. Create a virtual reality (VR) landscape that will help the police force navigate the situation by taking a photo using the phone and Cardboard Camera app (refer to steps 5 – 10 on the handout). Keep in mind that the Google Cardboard camera can record both image and sound.

**Plan it out:** Write out some ideas for your VR landscape below.

**Perform it!** Refer to steps 5 – 10 in Part II on the handout to record your VR landscape.

**Explain your reasoning:** How would this VR landscape work? Why would it work? Write your reasoning below.

**In practice:** As a group, answer the questions below.

 How else can VR be useful for field of criminal justice?

 How would you improve upon VR technology?

**Time to share:** Swap your VR landscape to another group! Ask them to guess what you're trying to do...did they get it?