Virtual Reality
Student Copy

9:00am – 9:30am	Cultural Connection
9:30am – 9:45am	QR PowerPoint
9:45am – 10:00am	Activity #1
10:00am – 10:10am	Finish QR PowerPoint
10:10am – 11:00am	Activity #2
11:00am – 11:30am	Augmented Reality PowerPoint
11:30am – 12:00pm	Activity #3
12:00pm – 1:00pm	Lunch
1:00pm – 1:30pm	Virtual Reality PowerPoint
1:30pm – 3:00pm	Activity #4 Google Cardboard

Objectives:
- To learn about and to use Quick Response (QR) codes, Augmented Reality, and Virtual Reality
- To become acquainted with multiple applications available for today's smart phones
- To gain hands on experience using QR codes, Augmented Reality, and Virtual reality tools

ND State Science Standards:
4.1.1 Understand that a system is made up of parts that work together
4.1.3 Understand that changes might occur in properties of materials and in position and motion of objects
4.1.5 Understand relations between form and function
4.2.1 Use and integrate the science processes of observing, questioning, hypothesizing, and reflecting to investigate their world
4.6.1 Know the various forms that technology can take
4.6.2 Distinguish how natural objects differ from those made by humans
4.6.3 Understand concepts and applications of science and technology
4.7.3 Understand how different types of resources affect our lives
4.7.5 Understand how culture influences the way people relate to science
8.1.2 Understand how models can be used to explain scientific principles
ND State Standards source: https://www.nd.gov/dpi/uploads/88/science_p.pdf

QR (Quick Response) Codes-

What is a QR code?
So you may have heard that QR Codes are set to become the 'next big thing' but thinking to yourself, what is a QR Code!? QR or Quick Response Codes are a type of two-dimensional barcode that can be read using smartphones and dedicated QR reading devices, that link directly to text, emails, websites, phone numbers and more! You may have even got to this site by scanning a QR code!

QR codes are huge in Japan and across the East, and are slowly beginning to become commonplace in the West. Soon enough you will see QR codes on product packaging, shop displays, printed and billboard advertisements as well as in emails and on websites. The scope of use for QR codes really is huge, particularly for the marketing and advertising of products, brands, services and anything else you can think of.

Who invented the QR code?

Denso-Wave - a subsidiary of the Toyota Group - are attributed with the creation of the QR Code as far back as 1994. Originally it was designed to be used to track parts in the vehicle manufacturing industry, but its use has since grown tremendously.

Why should I care about QR codes?

With as many as half of us now owning smartphones, and that number growing on a daily basis, QR Codes have the potential to have a major impact upon society and particularly in advertising, marketing and customer service with a wealth of product information just one scan away.

How is a QR code different from a normal 1D UPC barcode?

Ordinarily we think of a barcode as a collection of vertical lines; 2D Barcodes or QR Codes are different in that the data is stored in both directions and can be scanned vertically OR horizontally.

Whilst a standard 1D Barcode (UPC/EAN) stores up to 30 numbers, a QR Barcode can store up to a massive 7,089! It is this massive amount of data that enables links to such things as videos, Facebook or Twitter pages or a plethora of other website pages.

How do I scan a QR code?

If you have a smartphone like an iPhone, Android or Blackberry then there a number of different barcode scanner applications such as *Red Laser*, *Barcode Scanner* and *QR Scanner* that can read and decode data from a QR code. The majority of these are completely FREE, and all you have to do once you install one is to use your phone's camera to scan the barcode, which will then automatically load the encoded data for you.

What can be encoded into a QR code?

In its simplest sense a QR Code is an 'image-based hypertext link' that can be used offline – any URL can be encoded into a QR Code so essentially any webpage can be opened automatically as a result of scanning the barcode. If you want to encourage someone to like your Facebook page – have your Facebook profile page as the URL. Want your video to go viral – encode the URL in your QR Code. The options are endless.

In addition to website URLs a QR Code can also contain a phone number – so when it is scanned it prompts the user to call a particular number. Similarly, you can encode an SMS text message, V-card data or just plain alphanumeric text. The smartphone or 2D barcode reading device will automatically know which application to use to open the content embedded within the QR Code.

Where can QR codes be placed?

The answer to this is almost anywhere! QR Code printing can be done in newspapers, magazines, brochures, leaflets and on business cards. Further to this they can be put on product packaging or labels, or on billboards or even walls. You could even tattoo a QR Code on your body – now that would be an interesting take on giving a girl/guy your number in a bar!

You can use QR Codes on a website but they should not generally be used as a substitute for an old-fashioned hyperlink because obviously the user is already online and doesn't really want to fiddle around with their phone only to find a website they could have just clicked through to in half the time.

How can I make a QR code?
- You can make your own QR Codes using designated 2D barcode generators, some of which are listed below; however, you should first consider why it is that you want a QR Code and how you will use it. See the '*QR Codes for Marketing*' section below for more information on this.
- QR Code generators that are currently available include:
- http://www.qrstuff.com/
- http://qrcode.kaywa.com/

Activity #1

Go to one of the following websites to create your own QR code!
Print it off and share it with friends!
- http://www.qrstuff.com/
- http://qrcode.kaywa.com/

What size does a QR code have to be?
    Generally speaking, the larger the QR Code, the easier it is for it to be scanned, however most QR reading devices are able to scan images that are small enough to fit on a business card for example. This of course assumes that the quality of image is good.

QR code file formats.
- You can use the following file formats when creating a QR Code:
    - HTML Code
    - PNG File
    - Tiff File
    - SVG
    - EPS
- PNG files work particularly well as they can be resized very easily, meaning that you can easily scale the QR Code depending on where you want to put it.

QR codes for marketing
    If you want to use QR Codes for business or marketing purposes, then you should consider that people have higher expectations from scanning a QR Code than they do simply clicking a link on a website. You should offer something special or unique to people that have taken the time and effort to scan the barcode. For ideas of what this could be, or just for more information about QR Code Marketing have a look at Piranha Internet who have successfully incorporated the use of QR Codes into several marketing strategies for their clients.
    Also remember that many people won't know what a QR Code is or how to use it. Up until their use is more widespread you will need to provide instructions about what to do with a QR Code.

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Activity #2
QR code scavenger hunt

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- Break into your same groups from the beginning.
- Grab your student packet for the hunt.
- Search the school for the hidden QR codes! (8 total)
- Scan codes for the question and record your answers in the blanks below.
- PLEASE BE QUIET IN THE HALLS BECAUSE THERE MAY BE CLASSES!

QR code scavenger hunt worksheet:

Answer #1-_____

Answer #2-_____

Answer #3-_____

Answer #4-_____

Answer #5-_____

Answer #6-_____

Answer #7-

_____

Answer #8-_____

Augmented Reality

What is augmented reality?

Augmented reality is the integration of digital information with the user's environment in real time. Unlike virtual reality, which creates a totally artificial environment, augmented reality uses the existing environment and overlays new information on top of it.

Augmented Reality

Augmented reality is hidden content, most commonly hidden behind marker images, that can be included in printed and film media, as long as the marker is displayed for a suitable length of time, in a steady position for an application to identify and analyze it. Depending on the content, the marker may have to remain visible.

It is used more recently by advertisers where it is popular to create a 3D render of a product, such as a car, or football boot, and trigger this as an overlay to a marker. This allows the consumer to see a 360-degree image (more or less, sometimes the base of the item can be tricky to view) of the product. Depending on the quality of the augmentation, this can go as far as indicating the approximate size of the item, and allow the consumer to 'wear' the item, as viewed through their phone

Using a mobile application, a mobile phone's camera identifies and interprets a marker, often a black and white barcode image. The software analyses the marker and creates a virtual image overlay on the mobile phone's screen, tied to the position of the camera. This means the app works with the camera to interpret the angles and distance the mobile phone is away from the marker.
- Snapchat?

Activity #3
Table zombies
- Get into your same groups.
- Go to your app store and download 'TableZombies Augmented Reality' app.
- Turn to the TableZombies picture in your student handout.
- Scan the picture using the 'TableZombies' app.
- Fight through the waves of zombies in the 2 available levels!

Scan this image with your Table Zombies app.

Virtual Reality

Virtual Reality

        The definition of virtual reality comes, naturally, from the definitions for both 'virtual' and 'reality'. The definition of 'virtual' is near and reality is what we experience as human beings. So the term 'virtual reality' basically means 'near-reality'. This could, of course, mean anything but it usually refers to a specific type of reality emulation.

        Everything that we know about our reality comes by way of our senses. In other words, our entire experience of reality is simply a combination of sensory information and our brains sense-making mechanisms for that information. It stands to reason then, that if you can present your senses with made-up information, your perception of reality would also change in response to it. You would be presented with a version of reality that isn't really there, but from your perspective it would be perceived as real. Something we would refer to as a *virtual reality*.

How is virtual reality achieved?

        Today, virtual reality is usually implemented using computer technology. There are a range of systems that are used for this purpose, such as headsets, omni-directional treadmills and special gloves. These are used to actually stimulate our senses together in order to create the illusion of reality.

Virtual Reality

        This is more difficult than it sounds, since our senses and brains are evolved to provide us with a finely synchronized and mediated experience. If anything is even a little off, we can usually tell. These issues that divide convincing or enjoyable virtual reality experiences from jarring or unpleasant ones are partly technical and partly conceptual. Virtual reality technology needs to take our physiology into account. For example, the human visual field does not look like a video frame. We have (more or less) 180 degrees of vision and although you are not always consciously aware of your peripheral vision, if it were gone you'd notice. Similarly, when what your eyes and the vestibular system in your ears tell you are in conflict it can cause motion sickness. Which is what happens to some people on boats or when they read while in a car.

Why have virtual reality?

        This may seem like a lot of effort, and it is! What makes the development of virtual reality worthwhile? The potential entertainment value is clear. Immersive films and video games are good examples. The entertainment industry is after all a multi-billion dollar one and consumers are always keen on novelty. Virtual reality has many other, more serious, applications as well.

- Architecture
- Sports
- Medicine
- Entertainment

        Wherever it is too dangerous, expensive or impractical to do something in reality, virtual reality is the answer. From trainee fighter pilots to medical applications trainee surgeons, virtual reality allows us to take virtual risks in order to gain real world experience. As the cost of virtual reality goes down and it becomes more mainstream you can expect more serious uses, such as education or productivity applications, to come to the fore. Virtual reality and its cousin augmented reality could substantively change the way we interface with our digital technologies.

Activity #4
Google cardboard

-Get together with your original groups and pick up a Google Cardboard VR Headset
-Browse the many Virtual Reality apps available on your app store by searching "Free Virtual Reality"
-Download and try the different VR experiences with your Google Cardboard.