



Level 2 AR/VR

Teacher Handbook

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Lesson 1 Working with XR

01. OVERVIEW

Recap the important learnings from the previous module. Inform the students about the hands-on activities included in this module - Creating AR marker, creating 2D and 3D graphics, design thinking and innovation, and creating our own AR setup from scratch.

You have learnt about the concept of eXtended Reality (XR), how to interact with the digital world, and applications of XR in various sectors.

In this section, you will learn how to work with XR. We will take a look at the terminologies commonly used in XR – immersion, rendering, tracking, etc. Our discussion on the project cycle will make you acquainted with the steps involved in creating a basic augmented reality setup. You will also get a chance to exercise your skills in an activity where we will create our first XR application!

1.1. LEARNING OBJECTIVES

At the end of this unit, students will be able to:

- Understand the terminologies used in XR
- · Learn the basic steps involved in creating an XR project
- · Learn the algorithm behind an XR application

02. XR GLOSSARY

Teacher's Note: Ask the students to recall important words learnt in the previous module. Kindly let students know that this list of important words used in XR is suggestive and not exhaustive.

XR is now a part of our daily life. Therefore, it is important to stay updated with the basics of XR. As we delve into the details of the workflow of XR, let us start with the commonly used terms and acronyms. Given below is a glossary of terms extending across the immersive technology spectrum.

ACTIVITY: MATCH THE FOLLOWING

DURATION: 5 MIN

Match the definitions in column A with the appropriate terms in column B.

Column B
1. Virtual Reality (VR)
2. Mixed Reality (MR)
1. eXtended Reality (XR)
4. Augmented Reality (AR)



Answer:

Column A

- i. Adds digital elements to a live view
- ii. An experience that completely shuts out the real world
- iii. Interaction of real-world and digital objects
- iv. Umbrella term covering all the digital technology which enhance our senses

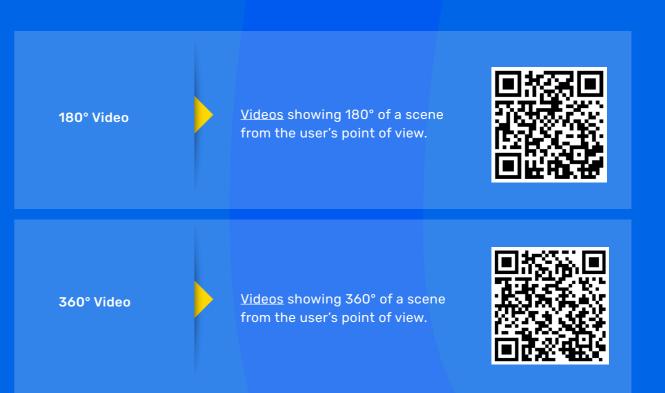
Column B

4. Augmented Reality (AR)



- 1. Virtual Reality (VR)
- 2. Mixed Reality (MR)
- 3. eXtended Reality (XR)





3D Animation

Creating a <u>sequence</u> of poses with a 3D object that creates the illusion of life-like movement.



Avatar

A virtual representation of an individual that may have life-like or animated features and that can convey a sense of one's identity.

Degrees of Freedom

Refers to the different <u>degrees of</u>
<u>movement</u> available to an object in
a space. Common XR devices have
3 DoF or 6 DoF.





A process used in headsets to track **Eye Tracking** movement of the user's eyes. A process used in headsets to track **Head Tracking** movement of the user's head. A hardware unit – e.g., a VR headset – worn on **Head Mounted** the user's head that provides the vehicle to Display (HMD) visualize and immerse in virtual worlds. Feedback to the users in order to simulate Haptics and real-world touch and force to make the Force Feedback interaction more real. A code which triggers XR experiences to appear **Markers** on any device. Resolution refers to the degree of detail an image holds. Higher resolutions make images sharper, which adds more detail to them. Resolution Low Resolution A matrix barcode that contains digital information about QR (Quick an item, object, person, place, or location. Activated by a Response) Codes smartphone camera, the code pulls up the linked information. Immersive content accessed directly through WebXR the web browser without an app.

Now that you have revised the terminology, let's do a quick activity!

03. AR APPLICATION ALGORITHM

ACTIVITY: BRUSHING ALGORITHM

DURATION: 5 MIN

Teacher's Note: This activity introduces the idea of algorithms to the students. You may ask students to do this activity in pairs where they act out each other's exact algorithms word by word.

Have you ever paid close attention to your routine of brushing teeth? What are the steps involved? What do you do in the beginning? How do you finish this daily morning ritual?

Try to write down the step-by-step instructions you follow to brush your teeth. Be as specific as possible. Do you think someone can accomplish this menial task if they religiously follow your instructions? Try it out with your family at home.



See this video for reference.

Answer:

This is a sample algorithm. Every student is free to create their own algorithm according to how they perform their daily ritual of brushing teeth.

BRUSHING TEETH

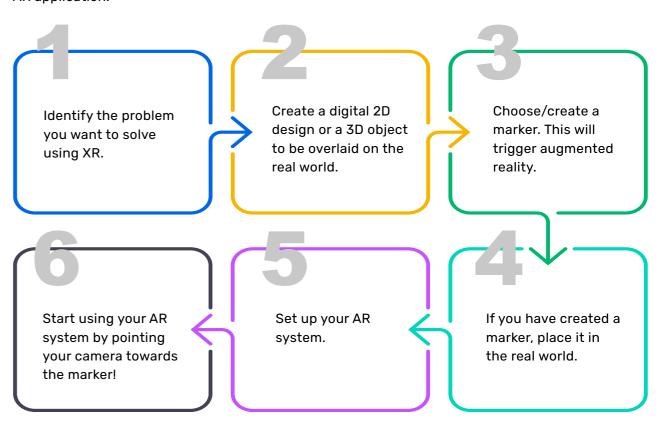
- 1. Check toothpaste levels. If levels are greater than 0 continue.
- 2. Unscrew toothpaste cap.
- 3. Add water and toothpaste to the toothbrush.
- 4. Screw toothpaste backup and replace.
- 5. Open Mouth.
- 6. Scrub your teeth.
- 7. Repeat till spit builds up.
- 8. Spit and repeat from step 6 until teeth are clean or until gums are bleeding.
- 9. Rinse mouth out with water or Listerine.
- 10. Put the toothbrush and toothpaste away.



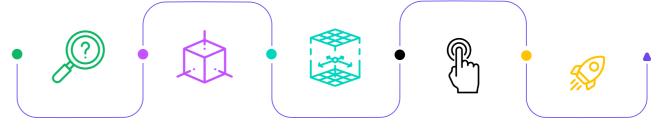
The outcome of the above activity is what an algorithm looks like. It is a set of instructions for solving a problem or accomplishing a task. A common example of an algorithm is a recipe, which consists of specific instructions for preparing a dish or meal.

The exact algorithms to create AR, VR, and MR differ for each technology respectively, and their discussion is beyond this course. However, we would be focusing on creating a basic AR application.

Here is a graphic displaying the step-by-step process of creating a marker-based AR application.



Here is a sample algorithm for an AR application which displays machine temperature.



Identified problem - How to display 3D dimensional shapes to geometry students.

Create the 3D design - A design containing various 3D shapes - cube, cuboid, sphere, cylinder, etc.

Choose a marker - For each shape, its respective picture in the geometry book.

Set up your system to trigger the appropriate 3D design whenever the device encounters the marker.

Start using it!



ACTIVITY: AR APPLICATION ALGORITHM

DURATION: 15 MIN

Teacher's Note: This activity requires students to create their first algorithm of a basic AR app. They will be following this algorithm at the end of the module to create their AR setup.

By now, you must have started thinking of all the ways you can use AR! This activity will provide you a chance to get into the shoes of an AR developer and write an algorithm to create a system of your own.

Start thinking: Can we use AR to display the temperature of a machine, or the recipe of a dish we eat at the restaurant, or the information about products in a store?

Write down the step-by-step instructions.

These are sample algorithms. Kindly encourage students to think about other problems which can be solved using AR. They are also welcome to tailor the algorithm of developing their AR solution.

Example 1:

- 1. Identified problem: See the recipe of a dish at the restaurant.
- 2. Create a 3D design: A graphic containing the recipe of the dish.
- 3. Choose a marker: The photo of the dish in the menu can act as a marker.
- 4. Set up the system: Whenever the AR system encounters the marker, it displays the dish recipe on the phone screen.
- 5. Start using it!

Example 2:

- 1. Identified problem: See product information manufacturing date, price, expiry date, etc. in a store.
- 2. Create a 3D design: A graphic containing the essential information about the product.
- 3. Choose a marker: The barcode present on the product can act as a marker.
- 4. Setup the system: Whenever the AR system encounters the marker, it displays the information of the product on the phone screen.
- 5. Start using it!



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NOTES



Lesson 2
Design
Thinking
with XR

01. OVERVIEW

Ask students what they do when faced with a problem in their lives. How do they solve that problem? Is there a process that they follow? Are they sure that their solution is the most optimum in their case?

In this section, the students will learn about innovating using design thinking. One of the most sought-after design processes. Design thinking is used by innovators world over to identify challenges and overcome them using creative solutions. We will undergo through the 5 stages of design thinking and learn tools and techniques to apply them to build out of the box solutions. At the end of this section, the students will get a chance to use their learnings to come up with an eXtended Reality (XR) solution for an identified problem.

1.1. LEARNING OBJECTIVES

At the end of this unit, students will be able to:

- Understand design thinking
- Learn the 5 stages of design thinking
- Learn how to apply design thinking with XR

02. INNOVATION AND DESIGN THINKING

ACTIVITY: OUT OF THE BOX

DURATION: 20 MIN

Teacher's Note: This activity encourages students to appreciate out of the box solutions and innovations.

We constantly face many challenges in our lives. Take a look at the images given below and discuss with your classmates the challenges that these products intend to overcome.









Do you think these products are different from the ones we use daily? How do you think someone might have come up with these "Out-of-the-Box" ideas?

Answer:

The observations made here are subjective and may differ for individual students. Kindly encourage them to look at the innovations from different perspectives. Below mentioned are one challenge each that the products above intend to overcome.

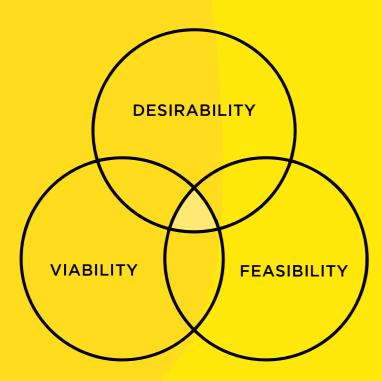
- 1. Holding the cup and saucer using both hands.
- 2. Lifting heavy loads to serve water to a large number of people.
- 3. Difficulty keeping round water bottles in a bag with books and copies.
- 4. Flat tires after getting punctured.



Design thinking is a process that helps to understand users, challenge prototype and test. By using design thinking, you make decisions based on what your users really want instead of relying only on historical data or risky bets. It also brings together what is desirable from a human point of view with what is technologically feasible and economically viable.



When applied to XR, it equips us to understand how to design new virtual experiences for the user. It is essential to develop a design thinking mindset for creating XR applications.



Design thinking is a human-centered process which is almost certainly the best creative process for "thinking outside the box".



Design Thinking has led to numerous innovative and creative solutions all over the world! Take a look at the videos below to understand how useful this process can be.

Teacher's Note: After playing each video, ask the students to come up with other solutions to solve the problems discussed in the videos.



Watch this heart-warming <u>video</u> of an innovative solution by kids to keep their fathers from over speeding.



Here is another story of how used plastic bottles are used as light bulbs in London



03. 5 STAGES OF DESIGN THINKING

The <u>design thinking process</u> has 5 stages – Empathise, Design, Ideate, Prototype, Test. We must remember that it is not a linear process but a circular one – we can move between different stages in any order, depending on our needs. Let us go through and understand all the 5 stages using a hypothetical case study.



STEP 1: EMPATHISE

Teacher's Note: Ask the students if they have heard this word before. What does it mean? How is it different from sympathy?

To identify or understand what our users see, feel or experience, in order to relate to the problem that others might be facing.

During this stage, we need to list down the pain points experienced by our user.

Example:

Theme: Water scarcity

User: Citizens who need to fetch water from a long distance.

Pain points:

(Put yourself in the shoes of the user. Now, think and write 3 more pain points experienced by the user)

- · Carry heavy load on head.
- Walk long distances daily.
- · Spinal injuries due to heavy load.

Answer:

These are sample pain points. Kindly encourage students to come up with as many pain points as they can.

- Wastage of time
- Unsafe, especially when going alone
- Long queues at the water source

STEP 2: DEFINE

Teacher's Note: Ask the students which problem will be easy to solve - A well-defined problem or a poorly-defined problem. Give them examples of both from our daily life: Poorly-defined problem - Buy a gift for your friend; Well-defined problem - Buy a gift for your friend who likes football and cartoons, under 500 rupees.

To analyse the observations from the empathise stage to identify the core problem - out of all the problems which could be solved, which one are we going to choose.

During this stage, we analyse the identified pain points during the empathise stage, and come up with one specific problem statement.

Example:

Problem statement 1: How might we help the user to move water from the source to their homes?

Problem statement 2: How might we help the user in travelling daily to and from the water source?

Now, can you come up with another problem statement for our user?

Problem statement 3: How might we help

Answer:

This is a sample problem statement. Kindly encourage students to formulate and choose any problem statement they feel needs to be solved.

Problem statement 3: How might we help the user to stay safe when travelling alone to fetch water?

STEP 3: IDEATE

Teacher's Note: Ask the students what they understand by idea. Where do ideas come from? Is there a limit to the ideas that we can generate?

To use creativity and innovation in order to generate as many solutions as possible, and choose a few of them to move forward.

During this stage, we imagine various solutions to solve the identified problem.

Example:

Possible solutions:

(Think and write 3 more solutions to Problem statement 1 in previous stage)

- Create a network of canals.
- Hire a truck to carry water.
- Design a water cart which is easy to move.

Answer:

These are sample solutions. Kindly encourage students to come up with as many solutions as they can.

- Use animals to carry water load on their backs.
- Use automatic drones to transport water from the source.
- Make an anti-gravity tank to move water.



STEP 4: PROTOTYPE

Teacher's Note: Tell the students that making a prototype is like taking down notes in a rough notebook before writing them in the fair notebook.

To make the early sample of the chosen solution.

During this stage, we choose one (or a few) solution(s) from the ideate stage and start building them. You can even combine multiple solutions to come up with a super solution!

Example:

Chosen solution: Design a water cart which is easy to move.

Now, can you draw a concept of another solution which you prefer from the last stage?



STEP 5: TEST

To take the feedback from the user on the prototype in order to improve our solution.



Here is a video that traces our example journey.

ACTIVITY: APPLY DESIGN THINKING

DURATION: 60 MIN

Teacher's Note: It is recommended that students perform this activity in groups of 3-5. Make sure that they spend enough time on each stage and understand the process of design thinking. Encourage them to write down their answers.

Sample responses are added for your reference.

You must have a starting understanding of the design thinking process by now. In this activity, we need to apply this creative process to design an XR solution.

1. Empathise

- a. What is your theme? (Example Education, Healthcare, Retail, Gender Equality, Climate Change, etc.) Healthcare
- b. Who is your user? Senior Citizen
- c. What are the pain points experienced by your user? Loneliness, difficulty in walking, injuries from frequent falls, missing regular medication, unable to manage their finances, etc.

2. Define

- a. What is your specific problem statement How might we help the user How might we help the senior citizens get rid of the feeling of loneliness?
- b. Why did you choose this problem? I chose this problem because feeling lonely for a long time can lead to depression and ill health.





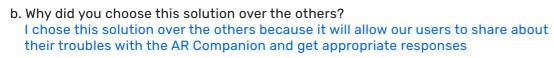
3. Ideate

- a. List down at least 6 XR based solutions to your problem. Remember, no idea is a bad idea.
- 1. An easily accessible virtual world for senior citizens.
- 2. An AR experience with a digital album of their family members.
- 3. Virtual experience of their hobbies such as visit to religious places, parks, libraries, etc.
- 4. Remote consultation with therapists in XR.
- 5. 360-degree recreation of their favourite TV shows from the past.
- 6. AR Companion powered by AI for casual conversations

4. Prototype

a. Choose any one solution and draw the prototype sketch.





5. Test

- a. Ask one of your friends or your teacher to act as your user.
- b. What do they like about your solution?

They liked that they could customise how the AR Companion would look and sound like.

c. According to them, what can be improved in the solution? According to them, they would want the AR Companion to speak multiple languages.

Bonus: If you feel like it, go through any of the previous stages to refine your solution further!





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Lesson 3 Making a Mark

ACTIVITY

01. OVERVIEW

Here, the students will explore the world of markers – the things which trigger their XR. They will learn how information is stored in the QR codes we scan for digital payments and how our cameras read them. This will be followed with a discussion and hands on activity on XR markers and how to create one on our own.

1.1. LEARNING OBJECTIVES

At the end of this unit, students will be able to:

- Learn how to store information through bar/QR codes
- Understand how to create markers for XR
- Try creating markers for XR

02. STORING INFORMATION WITH BARCODES/QR CODES

Teacher's Note: Ask the students if their parents make digital payments using mobile phones? What is the code that they scan before paying? What is it called? What information does it contain?



When you last went to a grocery store or a shopping mall, did you happen to see this image?

Do you know what it's called? Circle the answer that you think is right.

- 1. Bar Code
- 2. QR code

Answer: 2. QR code

If you chose 2, you are right!

But do you know what 'QR' stands for? Circle the correct answer.

A. Quick Review Code

B. Quick Response Code

C. Quick Reply Code

Answer: B. Quick Response Code



Barcode	QR Code
A way of storing numbers in a printed and computer understandable format.	Printed representation of data that can be scanned for retrieval of data.
1D or 2D format	1D or 2D format
Stores less information than QR code.	Stores more information than barcode. Used to store multimedia information.
Vertical arrangement of parallel lines.	Arrangement of square dots on square grids.
Stores information horizontally.	Stores information horizontally and vertically.
Based on Morse Code technology.	Based on Morse Code technology.

Teacher's Note: At this point, you can have a classroom discussion on where the students have come across barcodes and QR codes.

Project and play the video.



Watch this cool video to see how QR codes can be used to give an AR experience to the user



Now grab your phone and scan the QR code below on your smartphone to view the **Automotive WebAR Experience!**

03. XR MARKERS

One of many significant features of XR is how it bridges the gap between the virtual and the digital world in a variety of ways. This makes us understand how we can overlay the digital aspects onto real-world experiences.

Where do we overlay digital content with a live camera? Where do we place the objects of the content?

To be able to resolve such cases, two popular ways are marker-based and markerless AR.

Teacher's Note: You may let the students know that we will be creating a marker-based AR setup in this module. However, we have seen examples of both marker-based and markerless AR.





04. WHAT IS MARKERLESS AR?

Have you shopped online to purchase furniture and tried placing it at a corner in your home?

What about the fun Pokémon Go game that brought our childhood memories back? Isn't it fun to see Pokémons in your street or living room?

Such experiences are possible with the use of markerless AR through your live camera view.

Markerless AR enables the digital transformation via scanning the scenario or environment without the need of a prompt picture to load the AR content. This feature enables us to try various combinations of objects and styles, and locations.

What is Marker-based AR?

Marker-based AR connects the 3D model object to a real-world object. The AR application overlays a digital object that is merged to a static image that you can see on a newspaper or a flyer etc.

Through the live camera view, the scanner instantly recognizes the static image and displays the result which is a virtual image/object at a suitable position.

What is this static image that enables to show the virtual object?

The motionless picture or design which helps the device recognise which real-world object to tie the AR content to is popularly known as a trigger image or a marker.

Let's learn some more points about marker-based AR:

- An AR application can be used to scan the trigger images with the help of a tablet or smartphone to see the effect.
- Markers can be a bar code, a poster etc.
- The images used as markers can be black & white to keep it distinguished from the background setting.

Forget newspapers or flyers, wouldn't it be cool to have our textbooks with AR experiences with the help of marker-based AR.

Teacher's Note: Project and play the video



Watch this cool <u>video</u> to see how marker-based AR works connecting the 3D objects to real world images.

Marker-based ARs can display information such as video, animations, 3D objects, and more.

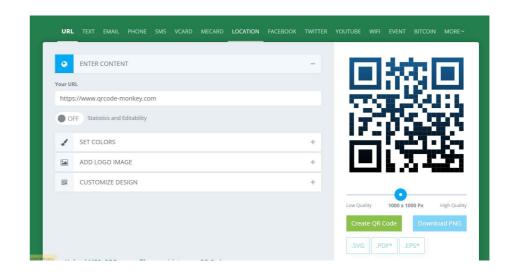
You can try creating your own marker to upload any 3D objects & animations or 2D images, which will help create the AR effect and further upload the static image to the platform which can be used as a marker.

How about trying one right now?

ACTIVITY CREATING MARKERS FOR XR

It's time you try what you have learned. Go to this <u>QRCode Monkey</u> on your device to create your own markerless WebAR through a QR code.

You can design, customise the outlook of the QR code and add a URL of your choice. Once the code is ready you can share it across and see how the QR code redirects you to the website link.

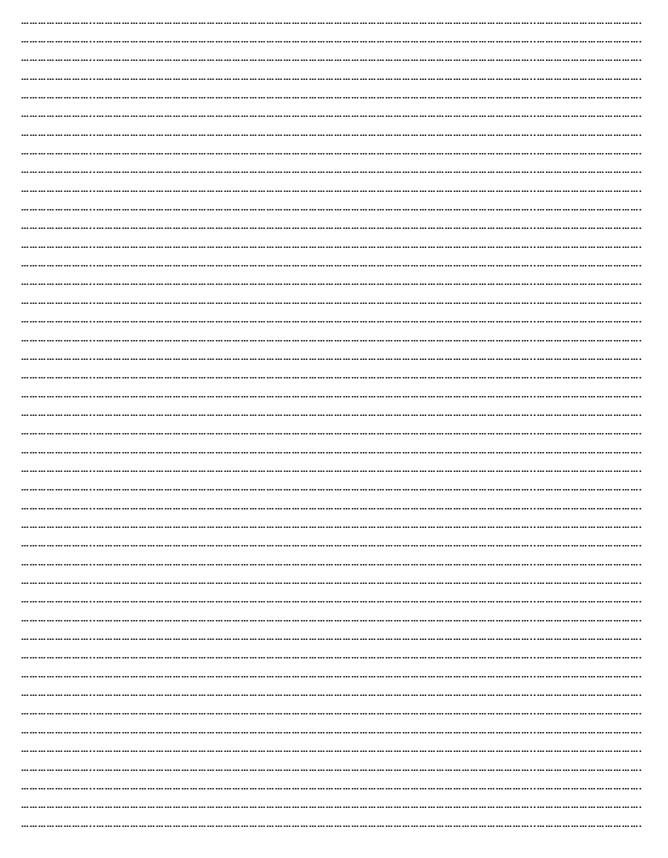


Such QR codes can be designed for markerless and marker-based AR in educational sectors, business, travel etc.



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Lesson 4 Designing for XR

01. OVERVIEW

In this section, the students will take a look at different ways of designing content for XR applications. They will gain the skill of designing 2D graphics. They can create their own image filters, a virtual greeting card, or maybe a personal signature. They will also get a chance to try their hands on designing 3D models like a modified car model, a futuristic house, etc. to be deployed in the XR space.

1.1. LEARNING OBJECTIVES

At the end of this unit, you will:

- · Learn a few ways to convert our physical world into digital objects
- · Create a 2D digital graphic
- Create a 3D digital model

02. CONVERTING FROM PHYSICAL TO DIGITAL

ACTIVITY

NOW VS THEN

DURATION: 5 MIN

This activity explores different ways of recording the physical world in digital mediums.

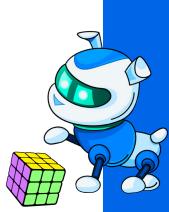
We live in a physical world that is turning more and more digital with every passing day. In this activity, we have listed a few things, which were done physically recently, and have become a part of the digital realm nowadays!

Can you find out what they are similar to in the digital world?

One has been done as an example for you.

PHYSICAL	DIGITAL
Letters	E-mails
Books	Ebooks
Music CDs	Online music players
Maps	GPS Maps
Shops	E-commerce stores
School Classrooms	Virtual Classrooms

The above activity will have given you an idea of how things around us, in our physical world, now have counterparts in the digital world too.



But have you ever thought about how this change came about? How do we convert the physical things in our lives into their digital avatars?

Let's take a look at a few methods of going from the physical to the digital.

- Latest Technology: New innovations in science and technology have led to rapid digitalization of our world. From ebooks to digital pens, we are surrounded by the latest technology.
- Typing: A lot of digital data is created by human beings when we type emails, tweets, WhatsApp messages etc.
- Sensors: Sensors help our machines record the happenings of the physical world in a digital format. They can digitise your voice, temperature readings, pulse rate, speed of your car, your weight, and almost anything else.
- Photos and Videos: A great way to store our physical world in the digital format is to click photos and record videos.
- Creating 2D and 3D Graphics: We can also replicate our physical world in the digital format by creating two- and three-dimensional graphics.

03. 2D GRAPHIC DESIGNING

Teacher's Note: Ask students if they love drawing, painting, sketching etc. Have they tried out digital drawings? How is it different from drawing using a pen and a paper?

Graphics and animation connect with people on an emotional level, evoking instant feelings of nostalgia, humor, and excitement. There are 2 popular kinds of graphics -2D and 3D - and both differ from each other in their creation and usage.

2D graphics are computer-generated digital images in 2 dimensions - something like this page that you are reading or the image at the beginning of this section. On a most basic level, they have a height and a width. You must be familiar with 2D graphics in cartoons, video games, and animated films.

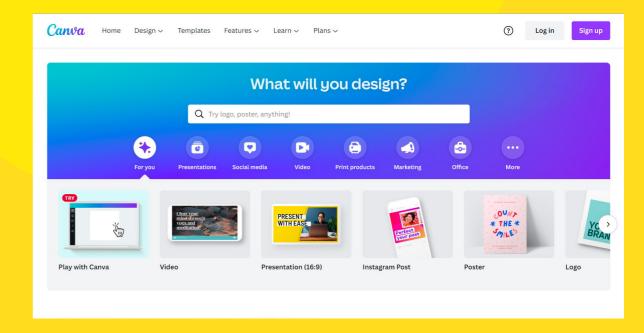
2D graphics can be created through various ways - using digital painting software such as Microsoft Paint, or more advanced software such as Adobe Photoshop or Canva.

Some elements are only available to be used with a Canva subscription whereas some others might contain a watermark if used with a free account.

Let us learn how to create a virtual greeting card using Canva.

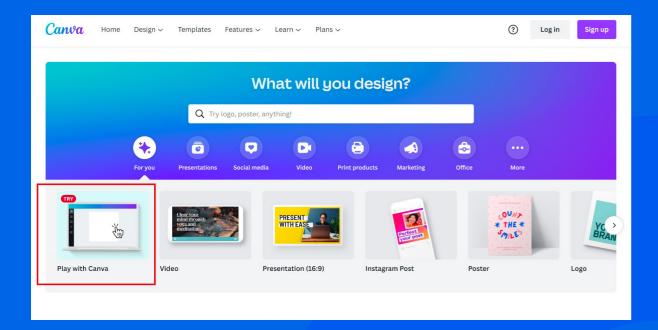


1. Open Canva

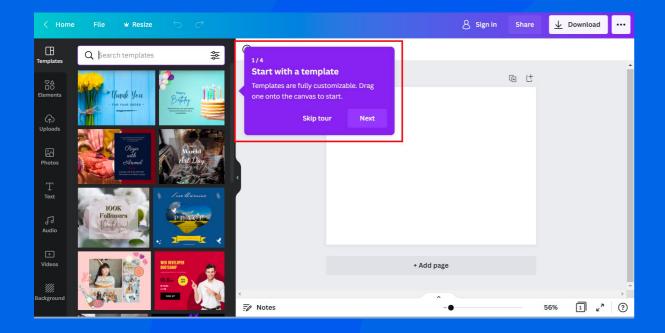




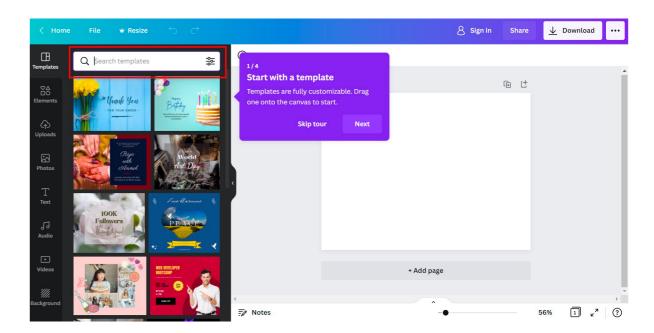
2. 2. Click on 'Play with Canva'.



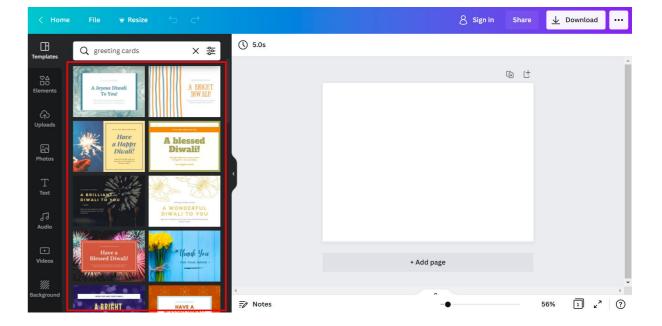
3. Feel free to use the tour to explore the platform.



4. Type 'greeting cards' in the 'Search templates' box.

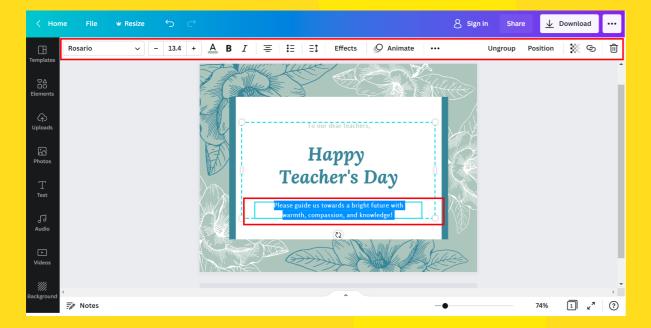


5. Pick any card you prefer from the search results by clicking on it.

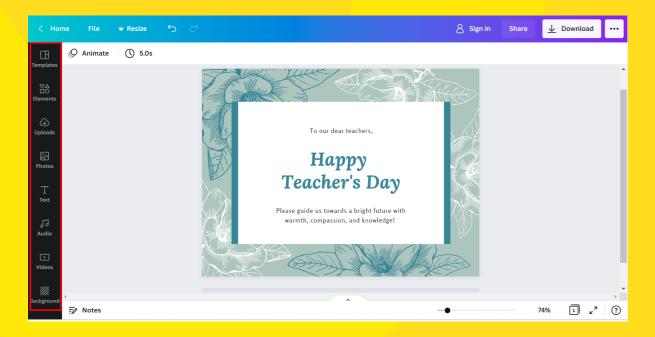




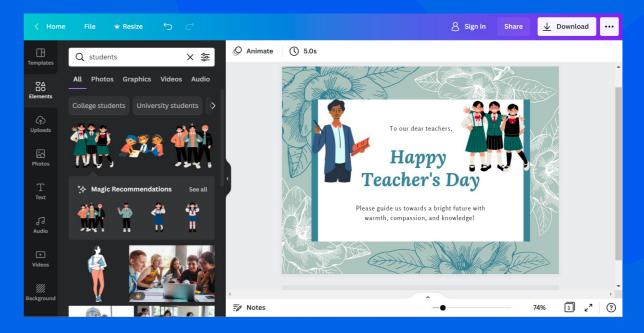
6. Start editing your card by double clicking on the parts you want to edit. Use the formatting option on the top to edit as you like!



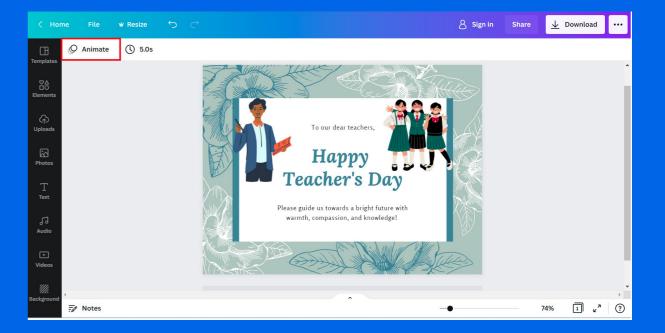
7. Use the option on the left-hand side to add more elements to your design.



8. Use your creativity to create the card that you want!

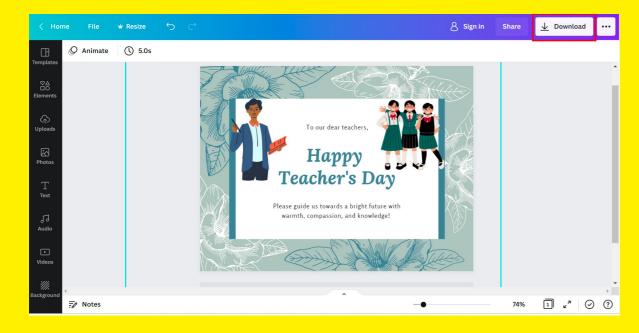


9. Bonus step: You may also animate your graphic by clicking on 'Animate' and adding various stylish animations to your design.





10. Once you are done, click on 'Download' to download your design in the correct format (PNG if you want an image or an MP4 video if you want an animation) on your device and share with friends!



11. Download card.



ACTIVITY INVITATION CARD

DURATION: 30 MIN

We hope you had fun creating that greeting card! Now, how about creating a birthday party invitation card for your friends and families? Put your designer hat on, and get started! Choose a template or start with a blank canvas. Add different fonts, place various elements to create a unique invitation and share!





04. 3D GRAPHICS DESIGNING

Teacher's Note: Ask the students if they have played with clay as kids. What did they like to model? Have they tried creating digital 3D models as well? How is it different from 3D modeling in real life?



Let's go through a demo showreel of some intriguing 3D graphics.

Another type of graphics that we talked about are 3D graphics - the models that you saw in the video at the beginning of this section. In addition to the 2 dimensions of height and width present in 2D graphics, 3D graphics also have a depth. This third dimension makes these graphics feel life like. They are extensively used nowadays in latest video games, animation movies, and XR applications.

You can create a 3D graphic by using various applications like Microsoft Paint 3D or Tinkercad. Let us learn to create a basic 3D model using the Tinkercad platform!

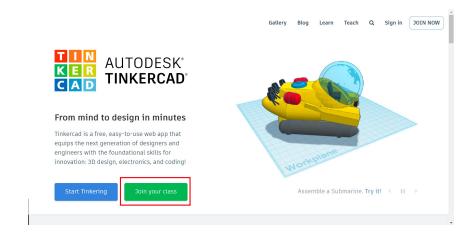
Teacher's Note: You will need to create a class on Tinkercad, before your students can begin this activity.



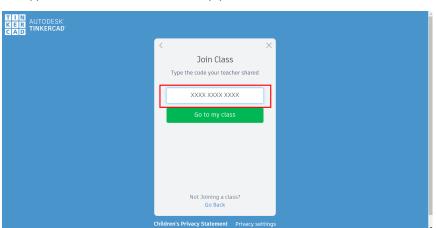
- Read this blog on how to create a Tinkercad class -Official Guide to Tinkercad Classrooms
- Add your students with their nicknames to the created Tinkercad class.



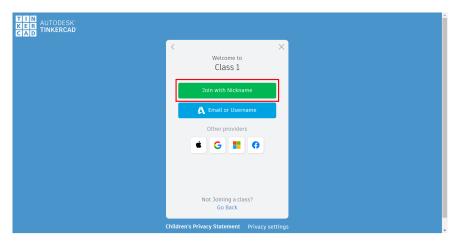
1. Open the platform -<u>Tinkercad</u> and click on 'Join your class'.



2. Type the class code shared by your teacher.



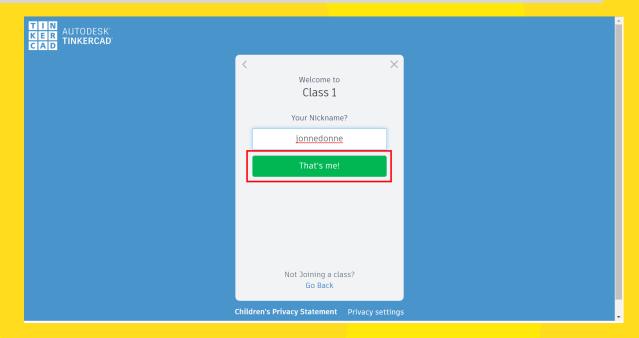
3. Click on 'Join with Nickname'



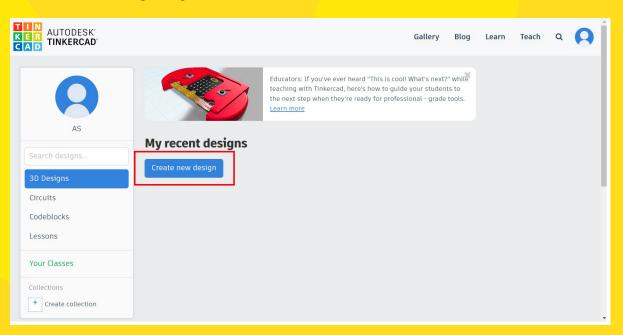


4. Enter your Nickname (please enter the nickname submitted with the teacher) and click 'That's me!'

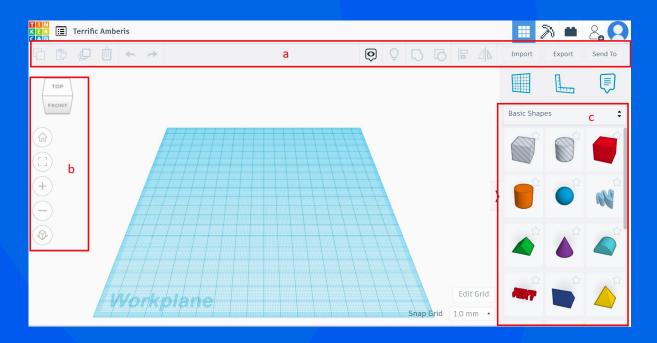
Teacher's Note: Please ensure that your students enter the nicknames that you have added to your classroom.



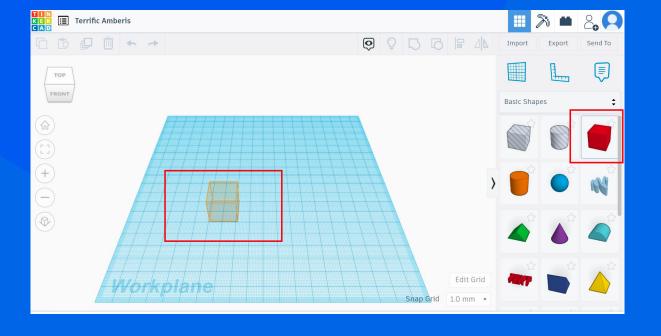
5. When you are in your class, you should arrive at the dashboard. Click on 'Create new design' to get started.



- 6. This is what a project's main interface looks like. As you would expect, the very center is the "Workplane", upon which models are created and manipulated. The interface is also composed of the following:
 - Top toolbar, with more general tools like 'Copy', 'Paste'", and 'Delete' on the left and design operations like 'Group' and 'Align' on the right.
 - Navigation tools for basic orientation like zoom in and out. Note that these specific tools can also be used via mouse (left click, right click, and scroll
 - Shape panel, containing all building blocks for designing, including basic shapes like cubes, spheres, and text. (This can be a fun box to explore, as it has many interesting and sometimes customizable options!)

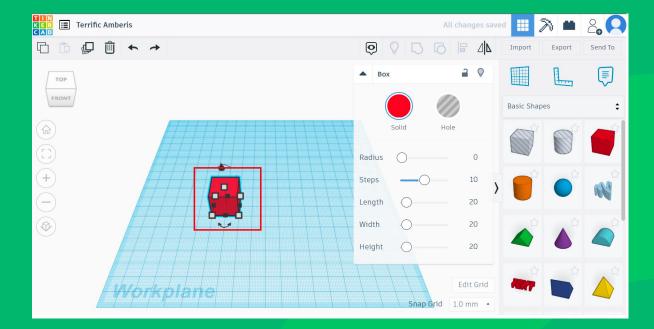


7. Let's begin by selecting a box and placing it on the workplane by clicking at the desired location on the workplane.

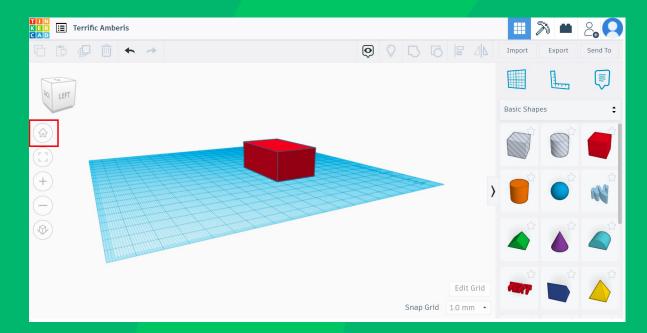




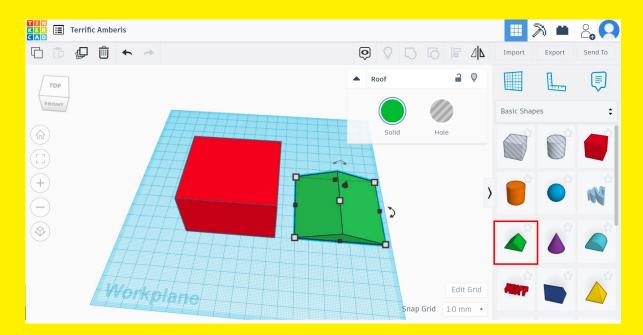
8. You can select the shape by clicking on it. This also allows us to modify the shape by dragging and dropping white colorued square blocks. Try to change the height, width and depth of the box as per your need.



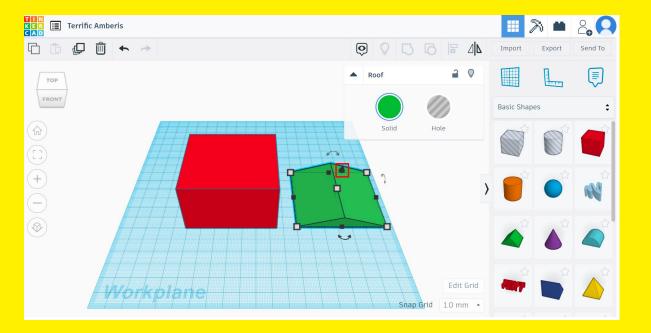
9. Hold down your right mouse button to move around and change the view of the shape. You can click on the home button to go back to the default view.



10. You can add multiple shapes by selecting them from the inventory.

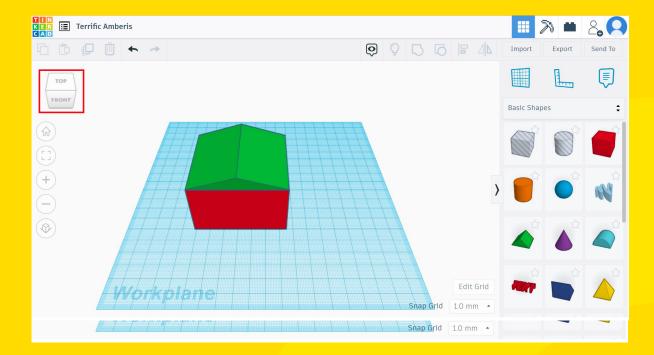


11. Click on the black arrow on top of the shapes to lift them up.

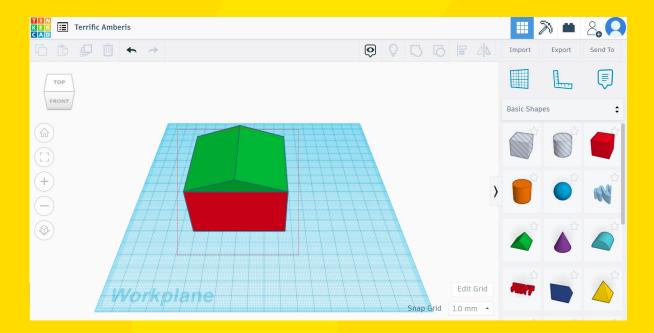


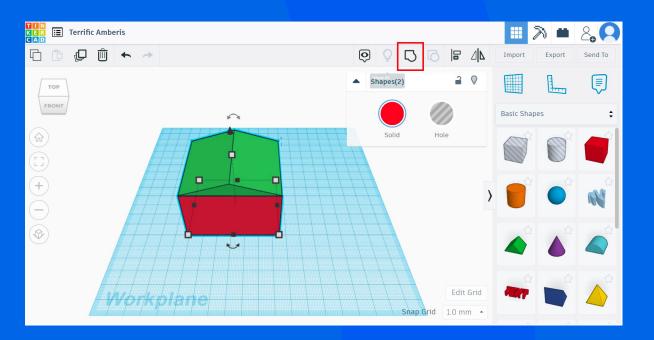


12. Move the Green colored roof and place it on top of the red colored box to make a house! Use the different views to make your job easier.

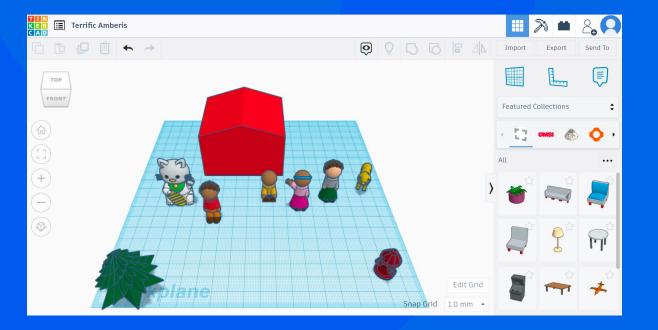


13. To join both the shapes together, click the left mouse button and drag a window around the two shapes. Then click on the group icon or hit Ctrl+G. You will see the colour of the two shapes change to a single color once they are joined together!





14. Go ahead and explore more. Add fun shapes from the inventory to create your design.





Here is a list of comprehensive <u>Tinkercad tutorials</u> to help you if you face any challenges.



ACTIVITY DIGITAL SCHOOL

DURATION: 30 MIN

Teacher's Note: Students may choose any other model to design. Kindly ask them to go for something simple in the beginning, and try their hands out with more complex shapes once they are familiar with the platform.

Are you excited to design more 3D models now?

We sure hope so!

In this activity, let us try to create a simplified 3D model of your school campus. Include different shapes, join them together, break them apart! Include characters, trees, and other structures, and let's see who can create a more life-like model, which is your school!





NOTES



Lesson 5
Setting
up XR

01. OVERVIEW

In this last section, the students will have a chance to put into practice all the skills which they have learnt in the subject – fundamental concepts of XR, identifying problems, creating markers, designing digital layers, and more to create their own XR setup. At the end of this section, they will have a fair understanding of creating a basic XR project.

1.1. Learning Objectives

At the end of this unit, you will be able to create a basic XR setup.

02. CREATE AN XR SETUP

Welcome to the last section of this course on extended reality. During this course, we have familiarized ourselves with the idea of extended reality and its benefits. We have also accumulated a few skills on the way to help us create an AR experience - how to apply design thinking, how to create QR codes, and how to create 2D and 3D graphics.

It is time that we put all that into practice and create our very own AR setup! Are you ready? Let's go!

ACTIVITY : AR DESIGNS

DURATION: 3 HOURS

In this activity, we are going to create a drawing in the real world, create a digital layer, and then set up our AR system with a secret message for the user. This activity is divided into 5 levels.

Things you will need:



Pen or pencil



Computer with internet access



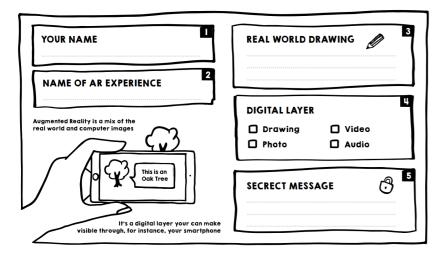
Smartphone (iOS or Android)



Drawing material (markers/crayons)



LEVEL 1 - AR DESIGN



In level 1, you will use the AR design prompts to design your own AR experience. You need to apply design thinking and come up with an idea for your AR project. Once you are ready, start responding to the design prompts. See the sample responses to the prompt below.

THEME:	Education
YOUR NAME:	Jonne Donne
NAME OF AR EXPERIENC	E:Secrets of our universe
REAL WORLD DRAWING:	Drawing of the solar system
DIGITAL WORLD DRAWING	G: Drawing
SECRET MESSAGE:	The Solar System is the gravitationally bound system of the Sun and the objects that orbit it. Of the bodies that orbit the Sun directly, the largest are the four gas and ice giants and the four terrestrial planets, followed by an unknown number of dwarf planets and innumerable small Solar System bodies.

Ask the students to write down their responses for the prompts.

Theme: What is going to be the theme of their AR experience?

Your Name: Name of the student

Name of AR Experience: Name of the AR solution of the student

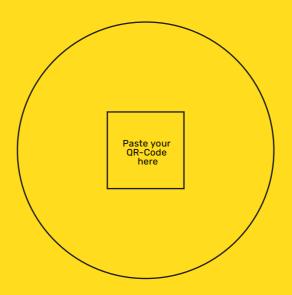
Real-world Drawing: The drawing that will be used to trigger the AR setup

Digital Layer: Students need to choose any one digital layer to be overlaid

on the real-world: Drawing/Photo/Video/Audio

Secret Message: The message displayed along with the digital layer

LEVEL 2 - MAKE A REAL-WORLD DRAWING



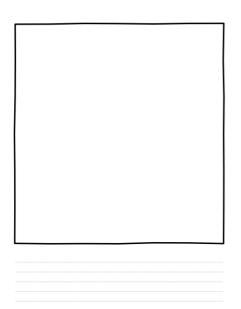
In this level, you will make a real-world drawing. This drawing will be scanned with your phone to start the AR experience with the help of a QR code that will go in the centre of your drawing. See the sample real world drawing below.



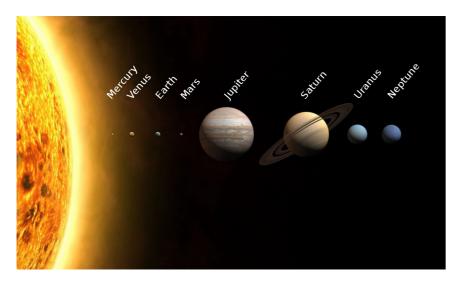
Teacher's Note: Ask the students to draw their 'real-world drawing'. Suggest them to leave an empty square space in the centre of the drawing (or wherever else they prefer) to put their QR code later on.



LEVEL 3 - CREATING A DIGITAL LAYER



In this level, you will create the digital layer and add a secret message to this layer. You need to draw the digital layer on paper for this activity, but you can also use images, videos, and other graphics as your digital layer. See the sample digital layer below.



Secret message

The Solar System is the gravitationally bound system of the Sun and the objects that orbit it. Of the bodies that orbit the Sun directly, the largest are the four gas and ice giants and the four terrestrial planets, followed by an unknown number of dwarf planets and innumerable small Solar System bodies.

Teacher's Note: Ask the students to draw a digital layer and write down their secret message. They will input this secret message in their AR app while creating the experience.

LEVEL 4 - BUILD YOUR AR EXPERIENCE.

In this level, you will use the Metaverse platform to build your AR experience. You will need to create an account on the metaverse platform at this level. You have to be at least 13 years old to create an account here. Ask your parents or teachers to create an account for you if you are not 13 years old yet.

Teacher's Note: Please ensure that the students who are 13 years of age or older create an account on the platform under your supervision. The younger students can seek their parents' or your help in creating their account.

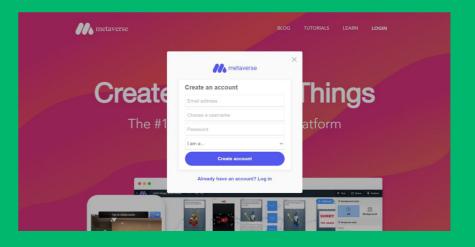
1. Go to Metaverse Studio



2. Click on 'Get Started'.

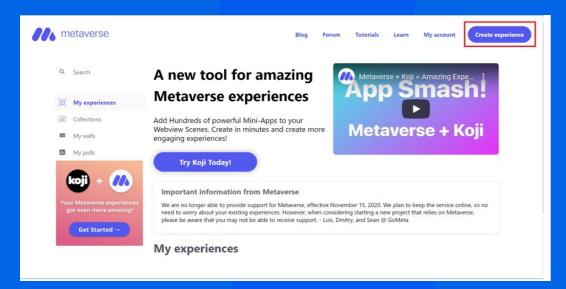


3. Enter an Email address, choose a username, set a strong password, and choose a role – 'Student' - to register.

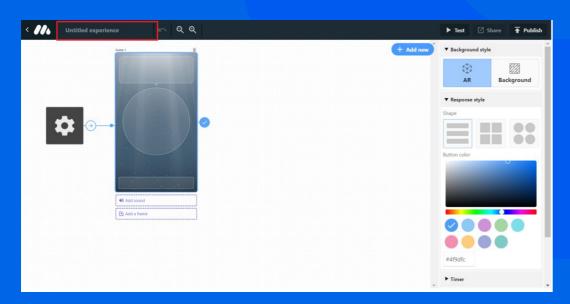




4. Click on 'Create Experience' to start building your AR app.



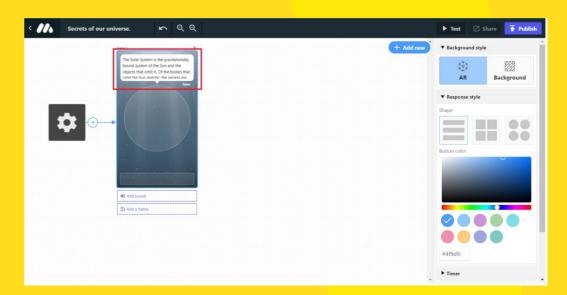
5. This is where you will create your AR app. Name your project from your AR design sheet.



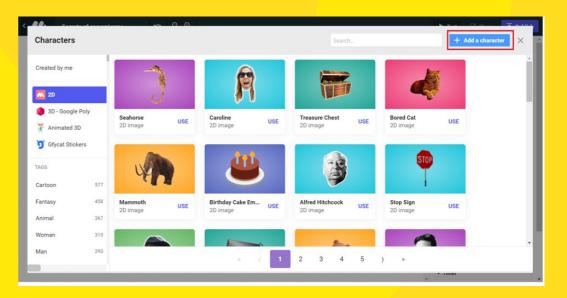
- 6. There are different widgets present in the Scene 1 template available in our workspace.
 - a. This is where we will add our secret message.
 - b. This is where we will add our digital layer.
 - c. This is a button. We will not be using it in this project.
 - d. We can use this to add a sound to our project.



7. Add the secret message, by clicking on the box. Type your message and hit 'Save' once you are done.

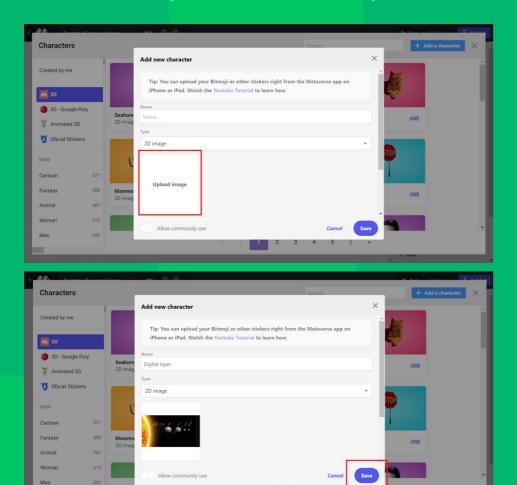


- 8. Add your digital layer drawing by clicking on the circle. You can click a photo of your digital drawing and add it here. (Remember our discussion on converting physical to digital?)
 - a. Click on 'Add a character'

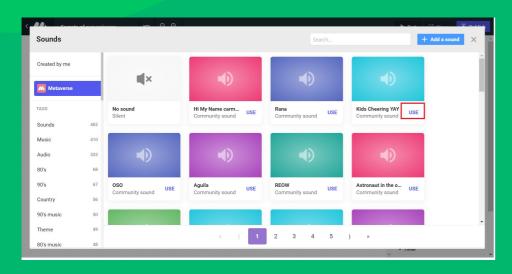




b. Click on 'Upload image'. You can even name the image. Then click 'Save'



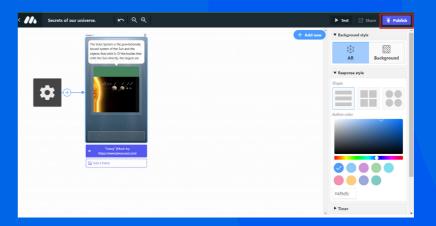
9. Add a sound to your app by clicking on 'Add sound'. Click 'Use' to select any sound.



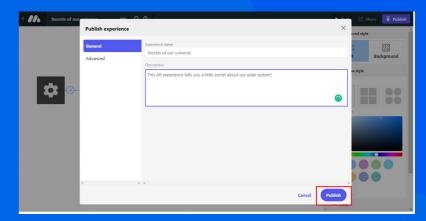
LEVEL 5 - PUBLISH AND USE YOUR EXPERIENCE

In this level, you will finalise and publish your experience. Then, we will try to use our experience using the metaverse mobile app!

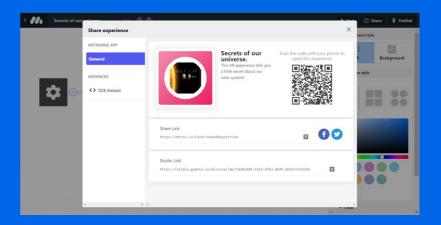
1. Click on 'Publish' on your AR experience screen.



2. Put in a description for your AR experience and click 'Publish'.



3. Our AR setup is ready to be used now! You can enjoy your own AR experience either by sharing the direct link or by using the QR code. We are going to use the QR code.





4. Take a print out of the QR code and paste it in the centre of your real-world drawing.



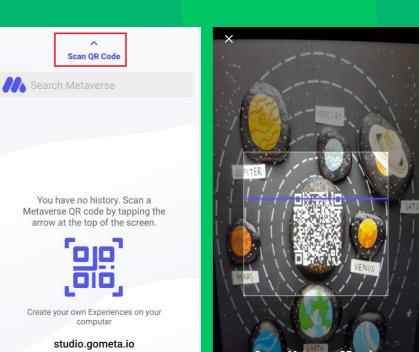
- 5. Install the Metaverse app on your mobile phone from here:
 - a. For iOS Metaverse Experience Browser on the App Store



b. For Android - <u>Metaverse - Augmented Reality - Apps on Google Play</u>



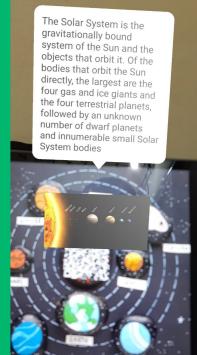
6. Open the metaverse app and click on 'Scan QR Code'



7. Point the camera to

the real-world image.

8. Enjoy the AR experience!

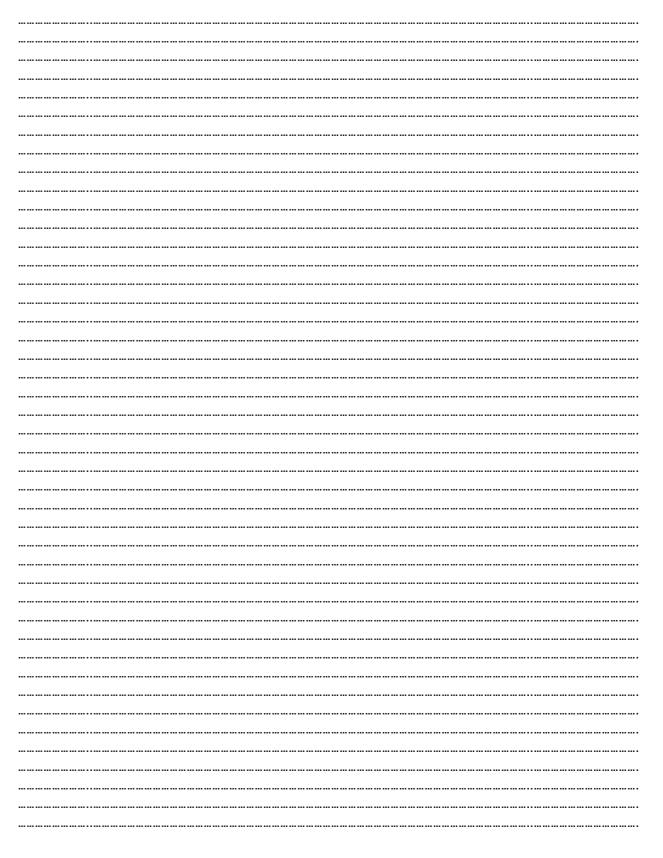


Isn't that super cool!? Congratulations on making your first XR experience! Well done.

We have just given you a glimpse of the possibilities with XR. Spend some time on the platform to explore how you can expand your AR experience. Add more scenes, experiment with 3D models and buttons, and become a part of the digital universe.

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Level 2 Bibliography

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- 2. Resource | "Home Canva", Canva
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Lesson 5: Setting up XR

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NOTES





Level 2 | AR/VR | Teacher Handbook

Curriculum developed by teachers and academic advisors, managed by 1M1B and supported by Meta Platforms Inc.