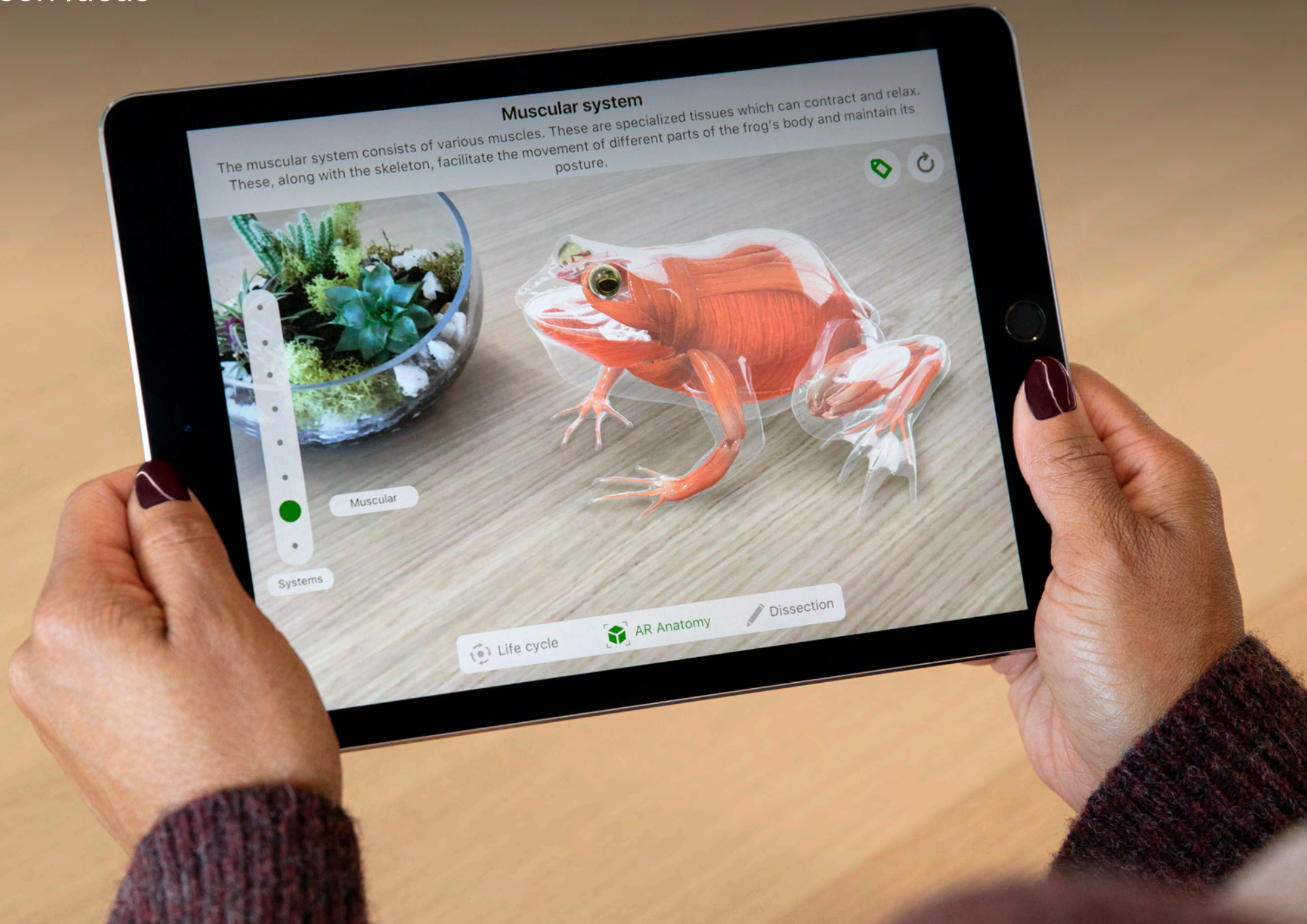


# Augmented Reality in Education



## Lesson Ideas



# Make connections and spark curiosity

Augmented reality (AR) lets students and teachers overlay information, visuals and other content into the real world, providing new context and powerful connections to enhance learning and build understanding. Teachers can use AR apps in their existing lessons to turn a classroom into the cosmos, make a history lesson as vivid as the present and let students peer inside everyday objects to understand how they're put together.

Imagine students walking around 3D shapes and graphs in maths class or moving iPad to visualise the systems of a virtual frog in science. Picture a language arts class in which students build stories with their own drawings and photos placed in the real world, providing a new stage for their written work. And a history class where students move around realistic ancient artefacts from museums placed directly into their environment.

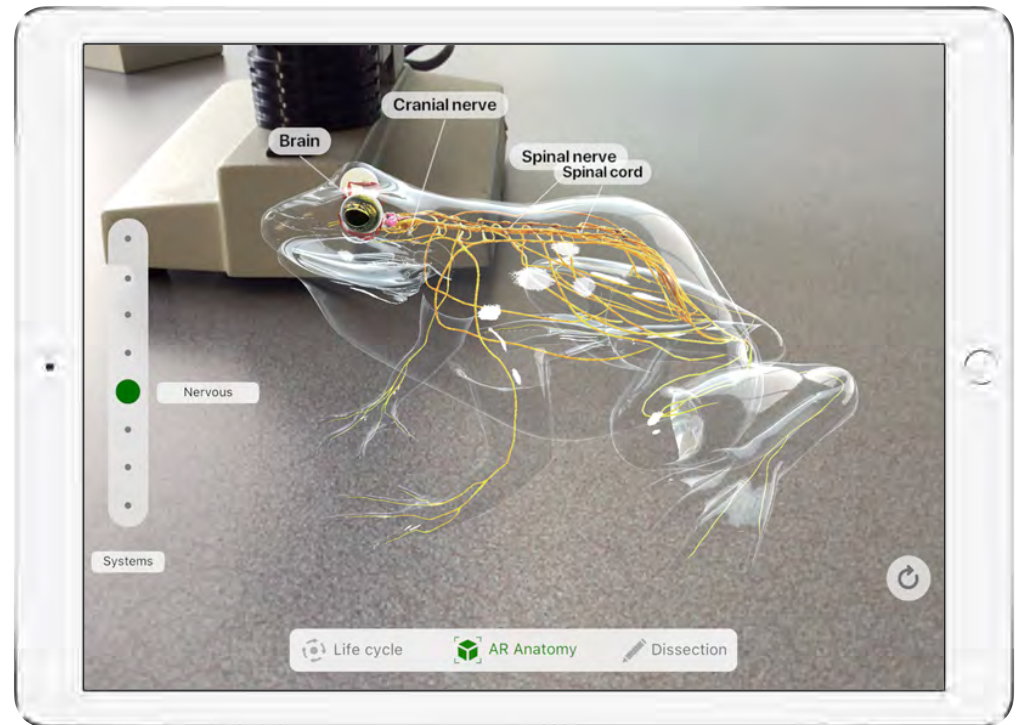


# Powerful technology for learning

Augmented reality combines the digital and real worlds. AR on iPad brings digital objects and information into the environment within an app, taking students beyond the screen and freeing them to interact with their surroundings in entirely new ways.

AR apps are powerful learning tools that boost engagement and motivation across subject areas. Teachers can use AR on iPad to:

- Spark engagement through movement and lifelike exploration
- Visualise and experiment with abstract concepts
- Go deeper into hidden layers and systems
- Tell stories in a whole new way
- Get students moving and exploring
- See both the big picture and the details
- Interact with resources otherwise not available
- Complement existing curricula
- Extend projects and provide challenges



# Why iPad for AR in learning

iPad is built for movement, making AR experiences easy and natural. It's packed with advanced technologies like accelerometers, motion sensors, powerful cameras and an operating system that was created specifically with AR in mind. The beautiful Retina display and its thin and light design make iPad a perfect device for experiencing AR.

Augmented reality on iPad delivers powerful new ways to enhance student learning through a combination of hardware and software:

- The large, immersive display provides an ideal lens to interact with iOS and AR apps.
- Fast processing speed and an incredible graphics engine combine with advanced cameras to stitch together virtual objects and the real world.
- Built-in sensors enable iPad to respond quickly and smoothly to movement.
- Pressure sensitivity and directional awareness of Apple Pencil extend AR interactions with lifelike precision.

All together, iPad creates an integrated augmented reality experience that's simply not possible on other platforms.



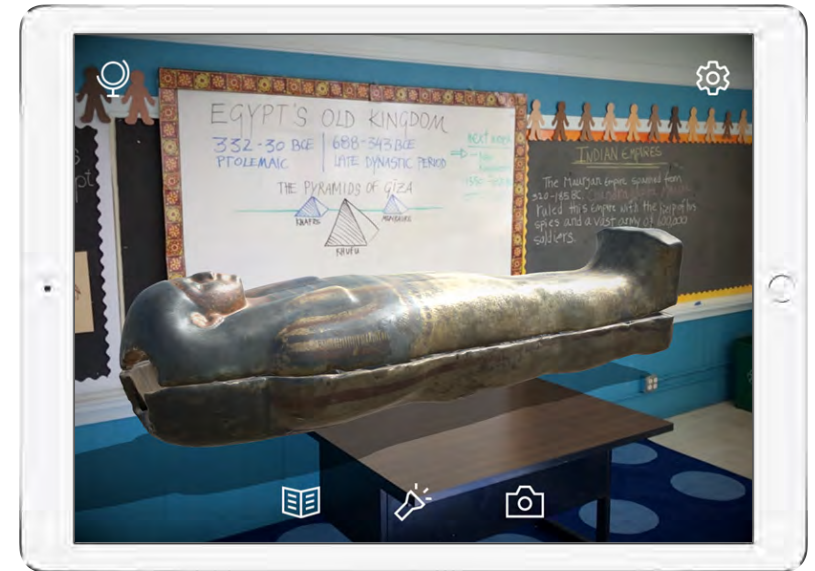


# Lesson Ideas: History

## Civilisations AR

Civilisations AR by the BBC lets you bring historical and cultural artefacts directly into your classroom or learning space. Explore a Rodin sculpture, an Egyptian sarcophagus, the Rosetta Stone, an ancient helmet and more. Students can see the actual size of artefacts, learn background information and explore these objects in a way they never could in person.

[Explore the Civilisations AR app](#)



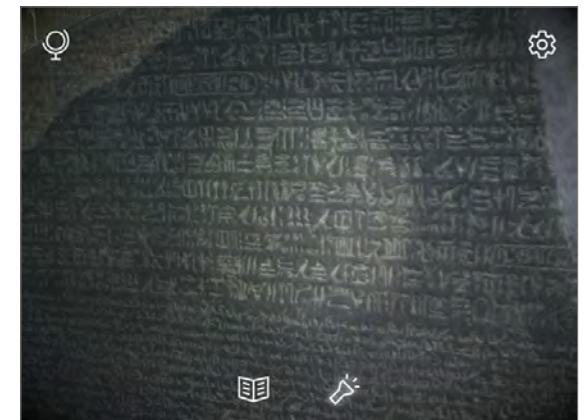
**Try this:** Select an ancient artefact and write an observation describing the object, its physical characteristics and its use.



① Place the globe browser on a flat surface near students. Navigate, then select an artefact, such as the Rosetta Stone or the Tang Dynasty Horse.



② Move around the object, noting its relative size, texture and details.



③ Tap the flashlight and learn more through interactive elements. Pick an angle or two to take photos that enhance the observational writing.



## Lesson Ideas: Maths

### Measure

Measure is an app included in iOS 12 for iPhone and iPad. It uses the camera and AR to measure the length or area of objects around you. Measure places points on edges of objects and can recognise selected shapes automatically. Students can use Measure to estimate the size and area of objects, and explore their environment in a new and fun way.

[Explore the Measure app](#)



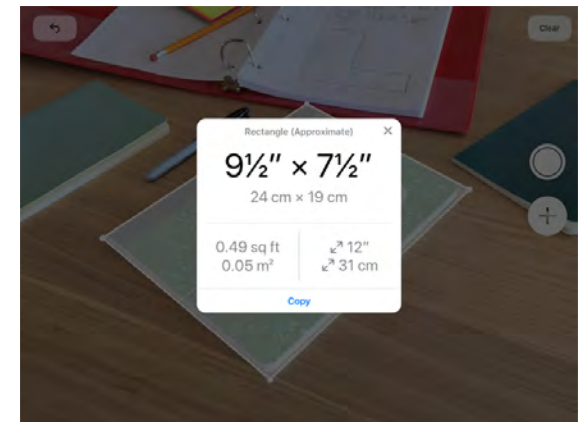
**Try this:** Find the length, height or area of objects that would normally be out of reach.



① Gather some rectangular objects like a pad of paper or notebook. Tap (+) to place points at the corners of the objects. Measure will tell you the length of each side as you add points.



② Measure also detects rectangles and quickly gives you the dimension. Try identifying rectangles and having Measure automatically find the edges and the dimensions of each object.



③ You can tap the rectangle and Measure will give you the dimensions and surface area. Estimate which objects have the most area of the ones you've gathered, and use Measure to verify your estimates.

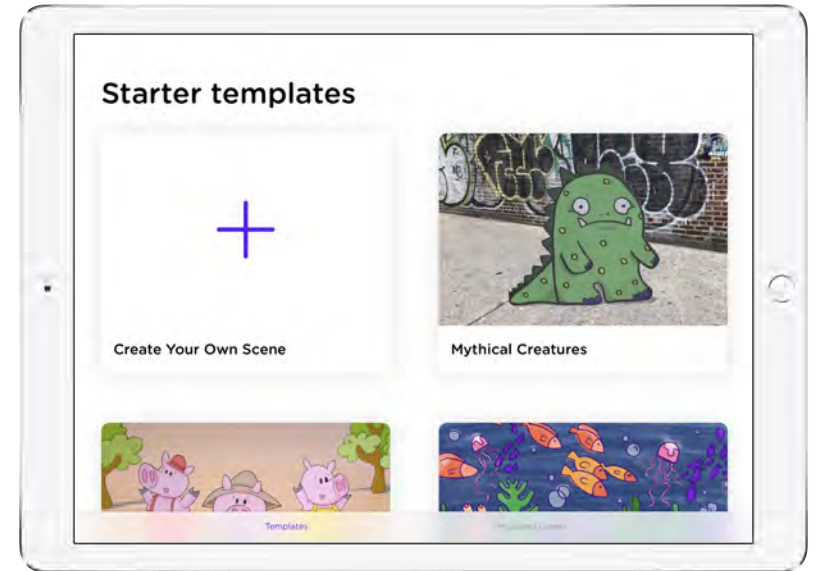


# Lesson Ideas: Literacy and Literature

## AR Makr

AR Makr lets students bring their own creativity and drawings into an interactive setting for storytelling. Students can draw or photograph their own scenery, characters and objects, then import and place those story elements into a physical setting using AR. Moving around a three-dimensional place, students can tell their stories while documenting and mapping out their journeys in a video recording captured on iPad.

[Explore the AR Makr app](#)



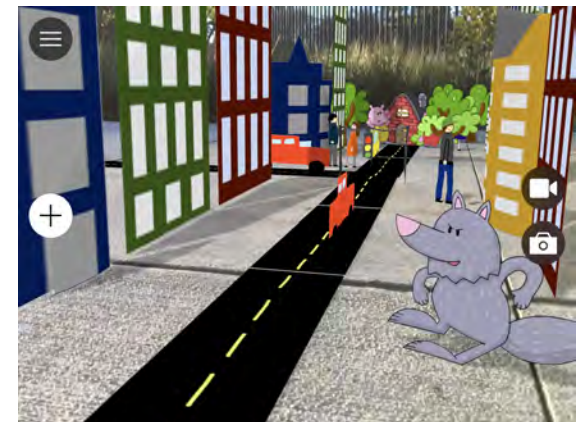
**Try this:** Explore how to build the setting of a story using a mixture of AR objects and the natural world. Use photos or videos to illustrate your story.



① Find a setting outside as the backdrop for your story. Choose the *Three Little Pigs* story and place elements from the story into your setting.



② Take photos or shoot a short video walkthrough of your scene. You can reset and start a new setting.



③ Make your own short story. Add pictures of your own drawings or draw directly on iPad in a drawing app. Incorporate your drawings into a video project from Everyone Can Create.

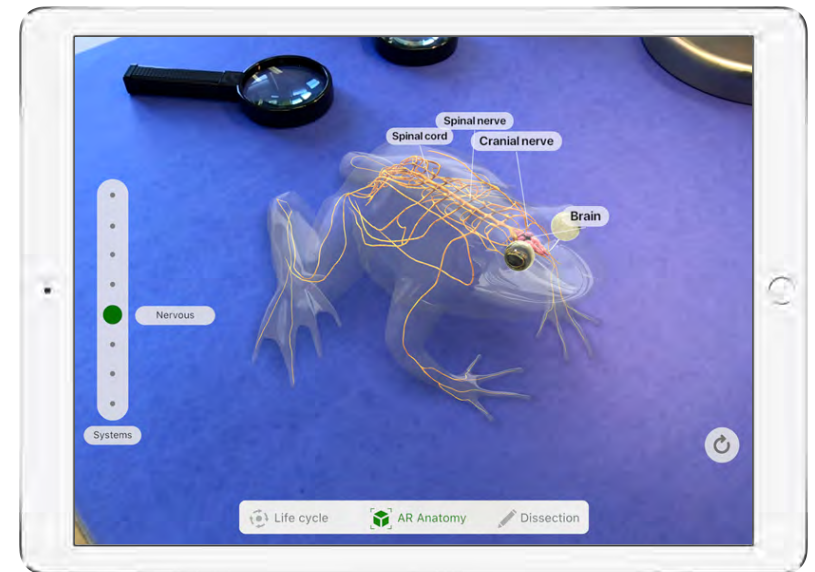


## Lesson Ideas: Science

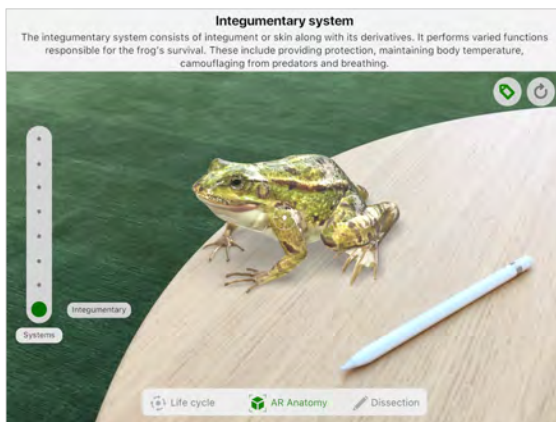
### Froggipedia

Froggipedia allows students to see the frog life cycle, study a living frog in AR and explore organs, systems and vocabulary in the context of a lifelike frog. The AR experience prepares students for a dissection, but lets them dissect a hyper-realistic virtual frog rather than a real one. Froggipedia complements traditional texts and diagrams, and engages different learning styles across grade levels.

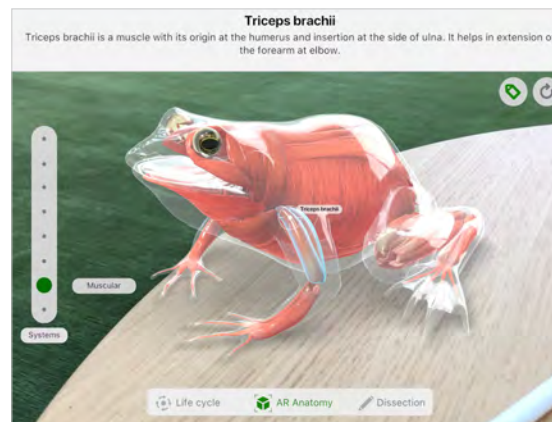
[Explore the Froggipedia app](#)



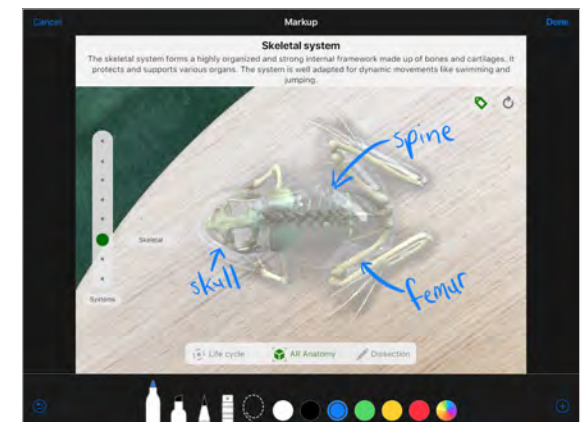
**Try this:** Explore the biological systems of a frog.



① Using the AR Anatomy feature of the app, place a frog on a table or other flat surface. Use the slider on the left to select a particular system to explore.



② Explore the frog from different angles. See the motion of the buccopharyngeal cavity or how bones are connected and structured. Point at a particular feature of the frog to learn more about it.



③ Take a screenshot and use the markup tools to add your own labels or to include in a science journal.





## Lesson Ideas: Science

### WWF Free Rivers

Whether AR is used in science or social studies, realistic models show the big picture. Through Free Rivers, an interactive storytelling experience, students learn how wildlife, people and the landscape depend on healthy, flowing rivers. Students can build and remove dams and see the impact throughout the landscape.

[Explore the WWF Free Rivers app](#)



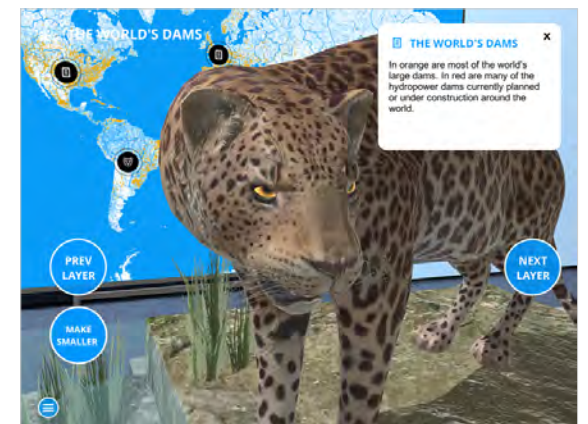
**Try this:** Dive into a river ecosystem and learn how water interacts with animals, plant life and human habitats. Then explore what happens when that's disrupted.



① Place the map on a flat surface and follow the onscreen steps to explore the river basin, its ecosystem and how to interact with it.



② Once you're oriented to the environment, choose a topic to explore further, such as the impact of dams on water flow and the downstream impact on plant and animal life.



③ Use Map mode to explore more rivers, animals, dams and layers of river ecosystems. Take screenshots and write about the impacts of a dam on the ecosystem.

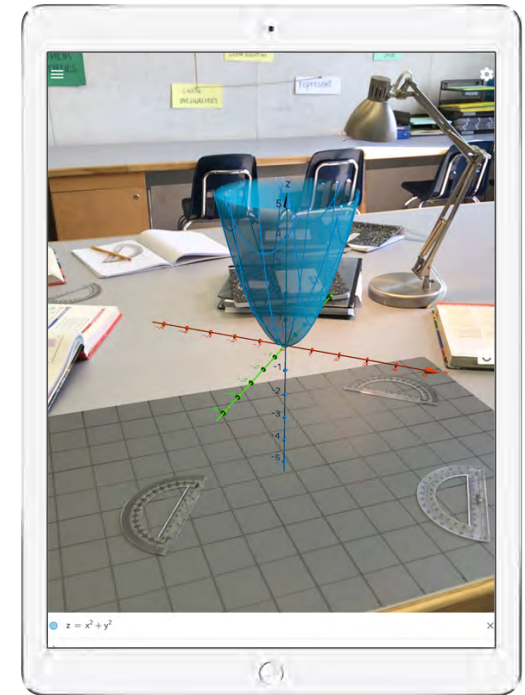


## Lesson Ideas: Maths

### GeoGebra Augmented Reality

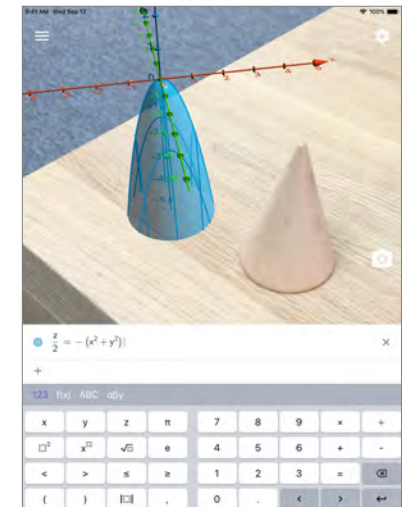
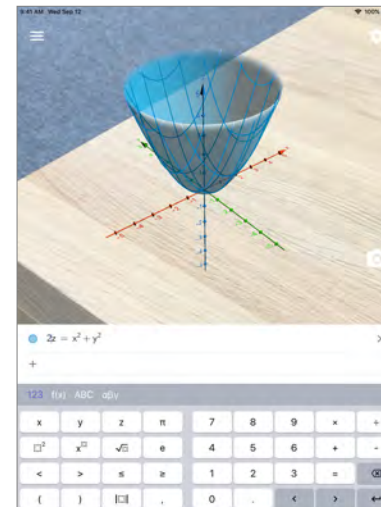
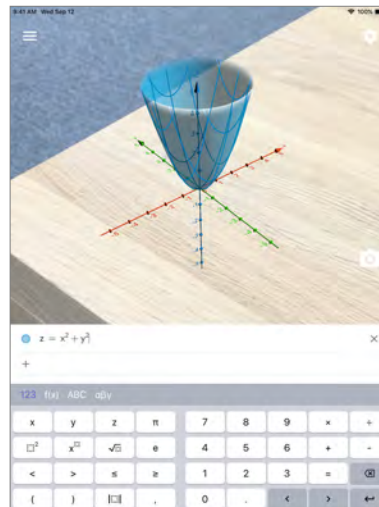
AR on iPad opens immersive experiences for students to help them visualise maths in the real world. GeoGebra Augmented Reality lets students explore maths by walking around 3D shapes that they create. They can better visualise maths in the world around them and customise equations to further their understanding.

[Explore the GeoGebra Augmented Reality app](#)



**Try this:** Use GeoGebra to introduce the z-axis and help students explore 3D shapes and equations.

- 1 Create a paraboloid using  $z = x^2 + y^2$  and place the shape on a table. Look at it from all angles.
- 2 Adjust the formula to transform the paraboloid and observe the results.
- 3 Find parabolic shapes around campus — in a common space or on the field — and adjust the equation to match the physical shapes you find. Take a screenshot to show how the equation matches each physical object. Share and compare your shape and equation with others.



## Tips for using AR apps

With AR apps on iPad, the camera presents a live, onscreen view of the physical world. Here are some tips to help you get the most out of AR apps:

**Lighting.** AR works great with consistent and even lighting. Avoid glare and areas with limited light.

**Surfaces.** Table surfaces with various colours and textures — such as wood grains — and walls with surface variation — such as marks and writing — work great with AR and are commonly found in schools. Avoid surfaces that are reflective, glossy or dark.

**Motion.** Find the right balance of movement. iPad develops a better understanding of a scene if the device is moving. Try moving slowly towards and around objects to capture your scene within an AR app.

**Screen recording.** Narrating and recording AR experiences is a great way for students to document and create projects. Learn how to [record your screen](#) or [take a screenshot](#) on iPad.

**Updates with iOS 12.** With ARKit 2 and iOS 12, multiple students and teachers can explore an AR app and simultaneously experience AR apps. You can also save AR experiences and resume them at another time. These new features provide great opportunities to collaborate and create within AR apps.

## Summary

AR on iPad provides a new set of tools and opportunities for teachers and students. The AR apps available today enable students to explore and learn in powerful ways. And this is just the beginning of the kinds of experiences and learning opportunities that will be available with AR and iPad as the number and types of apps and capabilities expand. Whether you want to extend an existing lesson or inspire new ones, you can incorporate AR apps across subject areas to elevate engagement and understanding.

## Resources

[Augmented Reality for iOS >](#)

[Apple Products for Learning >](#)

[More AR apps for iOS >](#)

AR on iPad requires iOS 11 or later and iPad (5th generation or later) or iPad Pro (any model).

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