



50 CREATIVE WAYS TO USE CLASSVR

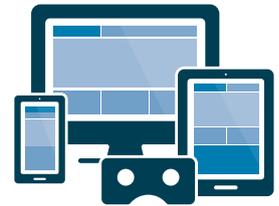
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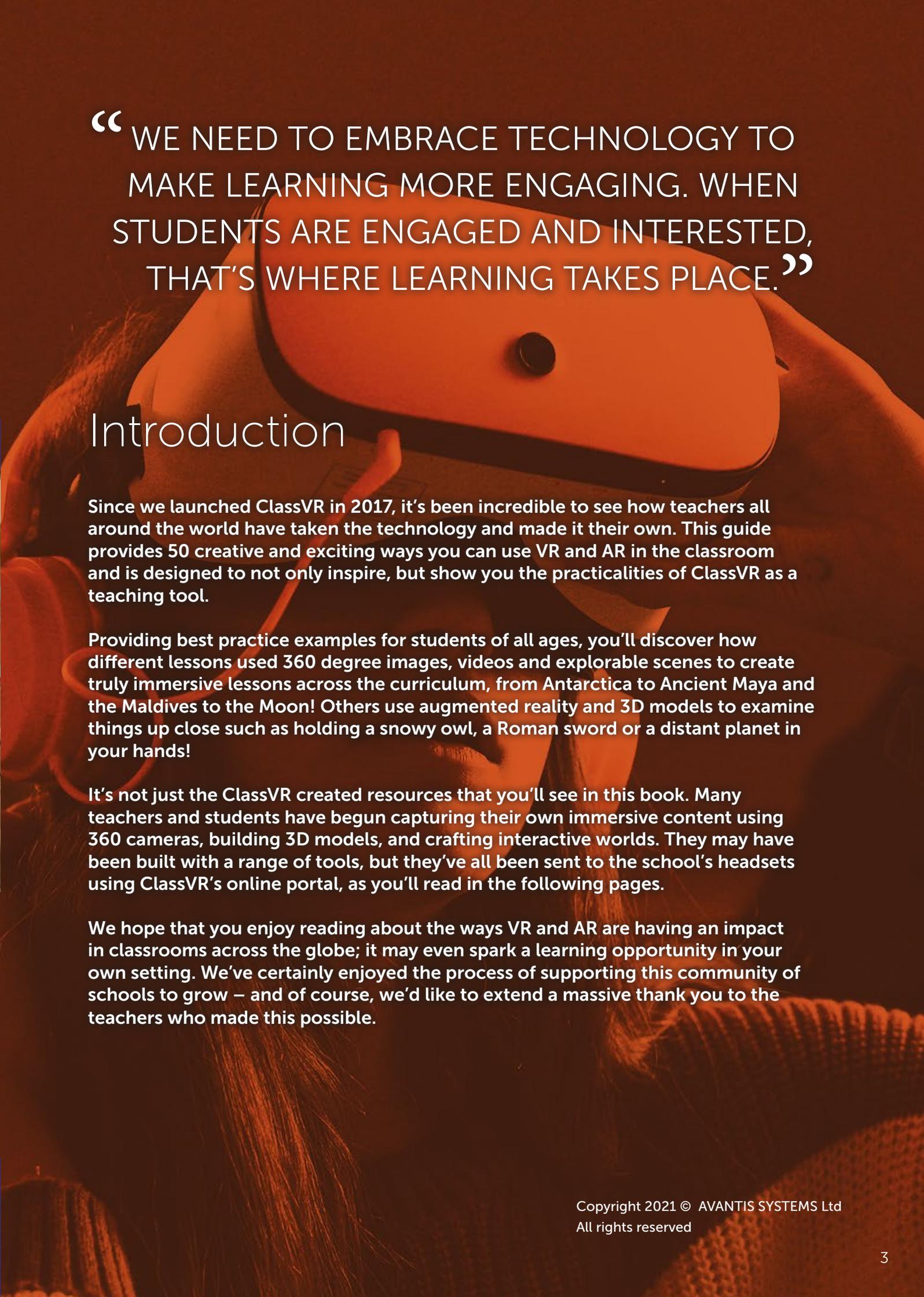


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“ WE NEED TO EMBRACE TECHNOLOGY TO MAKE LEARNING MORE ENGAGING. WHEN STUDENTS ARE ENGAGED AND INTERESTED, THAT’S WHERE LEARNING TAKES PLACE. ”

Introduction

Since we launched ClassVR in 2017, it’s been incredible to see how teachers all around the world have taken the technology and made it their own. This guide provides 50 creative and exciting ways you can use VR and AR in the classroom and is designed to not only inspire, but show you the practicalities of ClassVR as a teaching tool.

Providing best practice examples for students of all ages, you’ll discover how different lessons used 360 degree images, videos and explorable scenes to create truly immersive lessons across the curriculum, from Antarctica to Ancient Maya and the Maldives to the Moon! Others use augmented reality and 3D models to examine things up close such as holding a snowy owl, a Roman sword or a distant planet in your hands!

It’s not just the ClassVR created resources that you’ll see in this book. Many teachers and students have begun capturing their own immersive content using 360 cameras, building 3D models, and crafting interactive worlds. They may have been built with a range of tools, but they’ve all been sent to the school’s headsets using ClassVR’s online portal, as you’ll read in the following pages.

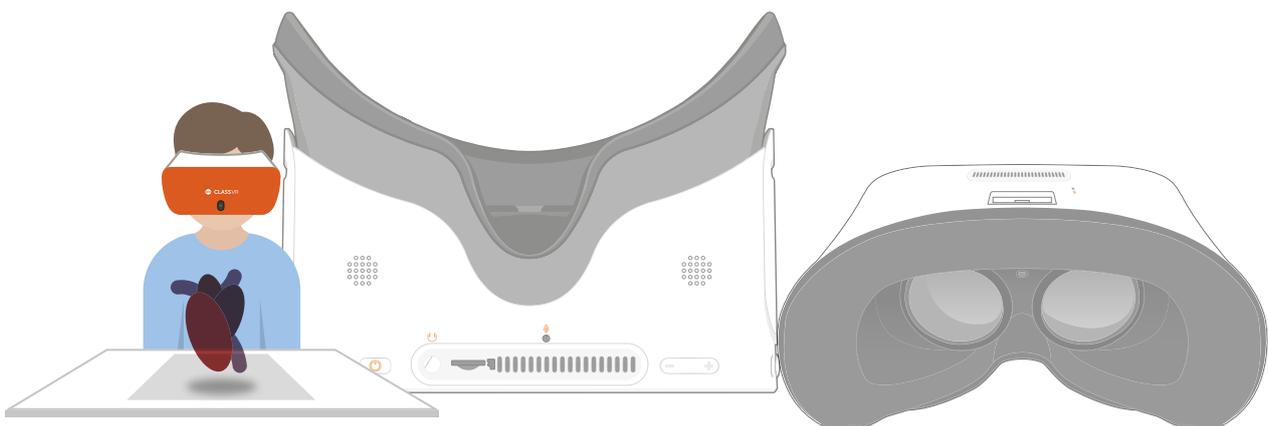
We hope that you enjoy reading about the ways VR and AR are having an impact in classrooms across the globe; it may even spark a learning opportunity in your own setting. We’ve certainly enjoyed the process of supporting this community of schools to grow – and of course, we’d like to extend a massive thank you to the teachers who made this possible.

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Return to Bude

ENGLISH Age 10-11



Zara
Conisbee



The Colleton Primary
School, Twyford, UK

Learning Aims:

- To write a recount of a recent trip to Bude, Cornwall.
- To include accurate descriptions of the area of Bude.
- To identify and comment on the uses of human and physical geographical features.

CONTEXT

Our Year Six pupils had recently spent four nights on a residential trip to Bude. We wanted to harness their exhilaration from this experience to generate some fantastic descriptive writing which needed to have a factual grounding that would build on their previous learning about geographical features. Our Year Six pupils have been travelling to Bude for their residential trip for years now and it is always used as a stimulus for writing but with our ClassVR headsets and 360° camera, we've captured the moments that our children remember, so their VR experience was personal to them.

PRACTICAL SESSION

Bude 2019 Playlist - Community Library

The children worked in two groups for their ClassVR experience. Half of the group were given ordinary photographs taken during the trip, whilst the other half had on the headsets showing a playlist of our 360° photos taken whilst in Bude. The two groups swapped over half way through. The children were enthusiastic about the opportunity to use the new VR technology and spotting themselves in the images brought a real thrill to the session. After the initial delight, the children were expected to note down the geographical features that they had encountered and this was to be done during and after viewing the photos. This was achievable using the VR images, but it was the descriptive phrases that they produced after reliving their days in Bude that were so impressive and really stood out after the lesson finished.

IMPACT ON LEARNING

The writing outcomes were fantastic! Despite returning from Bude several weeks earlier, the finer details that the children had seemingly forgotten were uncovered using the ClassVR headsets. The children managed to organise their 'memories' and write in much greater detail having viewed the 360° photos. Not only did the photos have a positive impact on their writing, the joy it brought to the children to reminisce about such a wonderful experience was priceless!

The Bude trip is a highly valued tradition in our school and the younger children look forward to it with great anticipation but also a degree of anxiety. We plan to use ClassVR in coming years to prepare our Year Sixes for their adventure.



Digital Cell Models

SCIENCE Age 6-12



Drewe Warndorff



Hartwell Elementary, CPS,
Cincinnati, Ohio, USA

Learning Aims:

- Students will apply their knowledge of cells to create 3D models using digital software.
- Students will convert their files (.stl to .glb) and test their cell models using the headsets.

CONTEXT

This lesson can be done as enrichment or as a technology extension within the science curriculum. It is used to support the visual and conceptual understanding of cells and their organelles while adding a tech and design element. Students should have or receive background information on cells, plant and animal, as well as the organelles. The quantity of organelles and functions can be chosen according to the curriculum. Students should also have a basic understanding of CoSpaces or Tinkercad in order to design the cell digitally.

PRACTICAL SESSION



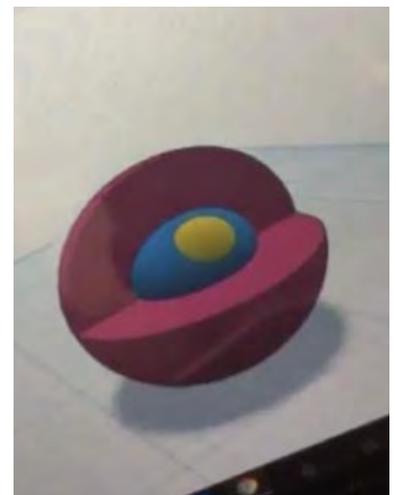
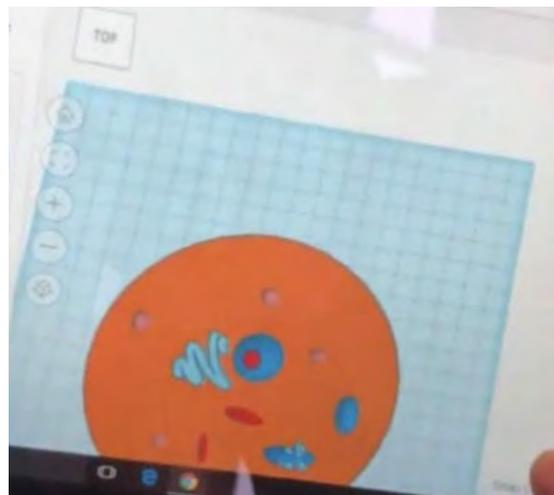
CoSpaces

I outlined the objective of creating a digital 3D model of a plant or animal cell with five identifiable organelles. Next, I led a digital software tutorial, in which I gave a brief demonstration of how to use the digital design software, including how to add shapes, remove sections and modify size. We focused on 3D cell model creation, whereby the students used the digital software to create their individual cell models that meet the project requirements.

Following on from the students submitting their .stl files, I converted them to .glb format and then uploaded the files to the ClassVR playlist. I was able to provide an AR/VR 'cell experience', where the students viewed their completed cell models using the ClassVR headsets. The students were able to then identify any imperfections in their models in order to make modifications/edits to their original files. As an extension, students could then send edited .stl files to a 3D printer, as well as adding informational tags to the organelles when clicked (which can be done in CoSpaces).

IMPACT ON LEARNING

This lesson allowed students to gain a better understanding of the cell and its organelles. By applying their content knowledge to a digital format, they were solidifying their content understanding and gaining technological skills necessary for thriving in a 21st century environment.



The Moon Field Trip

SCIENCE Age 5-11



Man Choi



Oh Jeong Elementary,
Gwangju City, South Korea

Learning Aims:

- To visit the Moon and go on a virtual field trip.
- To empathise with the astronauts' experiences on the Moon.
- To understand the vast nature of space.

CONTEXT

2019 is the 50th anniversary of the lunar landing and as a result, I wanted the students to have an experience of seeing the Moon. These experiences were part of our work exploring space and understanding how vast our solar system and universe are.

PRACTICAL SESSION



The Moon Playlist

The lesson started with the students viewing news videos about the lunar landing. We then watched the VR lunar lander experience, where the rocket touches down on the Moon – this prompted the children to consider how humans would reach the Moon and the features of a vehicle to get us from Earth to the Moon. We also viewed the moon news, together with the ClassVR videos and talked about what the students might want to do on the moon. We then investigated the various 3D models within the Moon playlist, such as the Apollo command module and another model showing the Moon's position from the Earth – the students held these models in their hands!

IMPACT ON LEARNING

The students experienced the feeling of going to the moon in virtual reality. I was able to provide an immersive experience of the Earth and the Moon and this helped the students to experience and understand the astronauts' feelings. It was an amazing class that brought a teleporting experience from the classroom to the Moon. ClassVR's incredible controls make it possible to conduct lessons while controlling the eyes of the students, making the class more enriching.



The Future is History

HISTORY & COMPUTING

Age 12-13

A ghetto is a part of a city in which members of a minority live, typically as a result of social, legal, or economic pressure.



Phil Nottingham



Daniel McKune



Joseph Cauldwell



The Mosslands School,
Merseyside, UK

Learning Aims:

- To be able to understand and explain significant events of the Holocaust.
- To be able to design and create a 3D world.
- To use computational language to improve the usability of the 3D world.

CONTEXT

After meeting with several departments, I developed a cross-curricular project between history and computing. By using 'CoSpaces', alongside the ClassVR headsets, pupils were able to create their own virtual world. A piece of work by which they could demonstrate both their understanding of a historical concept, and the effective use of coding and design to create an engaging digital space. After initially creating worlds to explore the coding, the students were given their brief for the creation of a Virtual Holocaust Museum: a space that a visitor could explore, that not only conveyed the creator's understanding of the topic material but also engaged the viewer through effective use of CoSpaces.

PRACTICAL SESSION



In pairs, the students built their worlds using CoSpaces. Over the course of six weeks, students had a range of both history and computing lessons to embed the depth of historical knowledge and learn the technicalities involved with the computer science aspect of creating a fully-functioning 3D world on CoSpaces. In week three, students learnt about the rise of Nazism and the final solution, as well as starting to create their space which reflected this series of chronological events. In week four, we introduced the headsets: this involved the students pulling together the various worlds they had created on CoSpaces to then test, trial and debug any coding or design errors. The final week involved sharing the spaces and providing peer feedback – evaluating both the technical computing elements and the historical accuracy of their content.

IMPACT ON LEARNING

The work the students produced was not only of an excellent standard but also of an incredible variety. Some students had chosen to create a traditional "gallery" with information adorning the walls of the space, while others had chosen to create enclosed spaces to simulate the conditions of the transport and accommodation of the camps involved in the events of the time period. After six weeks and approximately 8-10 hours working on the projects, the final session allowed pupils to explore each other's spaces. Many students commented on how they had effectively used the VR setting to create a sense of immersion, particularly long corridors and cramped train compartments.



Cave Exploration

KINDERGARTEN Age 5-6



Brittany Korstanje



Kinnwood Central Public School, Forest, Ontario, Canada

Learning Aims:

- To use language to communicate thinking, reflect and solve problems.
- To ask questions for a variety of purposes.

CONTEXT

Our students first practiced using the VR headsets to explore hot air balloons. This was sparked after reading the story "Not a Box". After heavily investigating what a hot air balloon looked like up close, and how it moves, our class ended up building a hot air balloon and encouraging school community members to come and experience hot air balloon expeditions. The students learned lots of scientific language and how to operate the VR headsets. Next, they expressed interest in caves and requested that we look up various cave expeditions.

PRACTICAL SESSION



Rocks and Caves Playlist

We started by using 360-degree cave images, which provoked a wide variety of questioning, researching, discovering, creating, and writing. After exploring a cave with the headsets, our students had many questions: Why are there icicles hanging? How do caves form? How could animals live in the dark? When they went on the expedition a second time, they were excited to talk about stalactites, stalagmites and columns which they were seeing and eagerly searched for troglodytes inside the cave. They recreated many of their own findings by building a large cave inside our classroom and creating paper and digital books. This extended to investigating water and ice caves, and researching animals that may live inside or on top of ice caves such as penguins. Students measured their height and compared it to these animals. Finally, they produced educational videos and provided QR codes to attach to the cave to add to this interactive experience when visitors arrived.

IMPACT ON LEARNING

We approach learning concepts by providing fun, interactive, authentic and rich experiences based on the interests and needs of our students. We are educators who listen, ask open-ended questions, wonder, problem-solve and discover with our students. We believe VR technology was the perfect learning tool to extend our students' ideas and promote analytical thinking. ClassVR engaged and inspired every student in our learning community. It added a third dimension to their learning experience that they could connect with and become inspired by.



Mary's Escape from Lochleven Castle

HISTORY Age 10-11



Simon
Luxford-Moore



ESMS Junior School,
Edinburgh, UK

Learning Aims:

- To describe the events surrounding Mary, Queen of Scots' imprisonment in Scotland and the support that led to her escape from Lochleven Castle.

CONTEXT

Following Mary's arrest, after the death of Lord Darnley, she was imprisoned in Lochleven Castle and forced to sign her abdication under threat of death. With the help of Willie and George Douglas she escaped during a masque May Day celebration from her third floor room. Children study the events surrounding her imprisonment and escape, looking at sources of evidence and completing a recount of her diary entry.

PRACTICAL SESSION

Lochleven Castle - Community Library

Following the lesson and prior to beginning Mary's diary entry, which details the plan of her escape, children experience the Lochleven Castle footage. Taken in the rain, it is incredibly atmospheric, and shows the outside of the castle walls down to the shore from which Mary escaped in a rowing boat. Back in 1568, the loch had a higher water level and reached the edge of the castle walls on one side. The extent of the water receding is highlighted beautifully in this footage which could, in itself, promote discussion about climate change. There is also still and video footage of inside the bailey of the castle showing the extent of Mary's freedom to walk the grounds. The pivotal footage is on the inside of the castle. Textbooks and websites often depict Lochleven Castle as quite grand and the idea of being able to hold a masque ball implies a large banquet hall. In reality, Lochleven Castle is very small and this makes Mary's escape all the more incredible and daring. Children are always impressed and amazed at the difference in size of what they imagine from printed textbooks to seeing, for themselves, the smaller reality. Best used as part of the plenary of a lesson to highlight the stark contrast of the site to the learners.

IMPACT ON LEARNING

Children experience the place of Mary's imprisonment and, due to the weather at the time of filming, develop an understanding of the 'feel' to her conditions on a tiny little island in Lochleven, Perthshire. This can be used beyond a historical context and is ideal for developing a piece of writing surrounding Mary's imprisonment. The playlist allows for the development of first-person emotional vocabulary to be discussed and used in written work.



Experiencing the Trenches

HISTORY Age 10-11



Anthony Isaac



Crowlands Primary School, Essex, UK

Learning Aims:

- To understand and explain some of the major events during World War One.
- To write in first person from the perspective of a soldier.

CONTEXT

This year marked the 100th anniversary of the ending of World War One, and Year 6 pupils at Crowlands Primary School marked the occasion by writing a piece from the point of view of those brave soldiers in the cold, unforgiving trenches. The anniversary is a hugely symbolic time and as such, we wanted this topic to be made even more personal, immersive and experiential. Most children started the unit of work with a limited conceptual understanding about life in the trenches and how a typical day would be; we therefore wanted to provide a learning experience to broaden and deepen their understanding and appreciation of the conditions and expectations which soldiers endured.

PRACTICAL SESSION

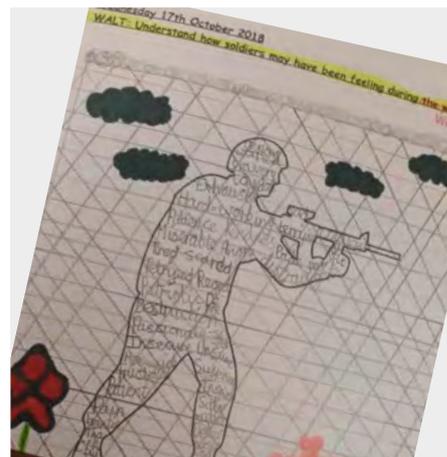
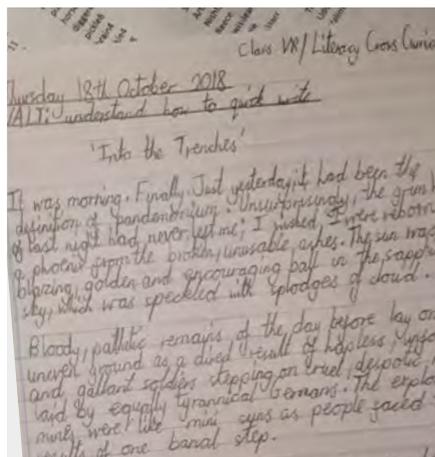
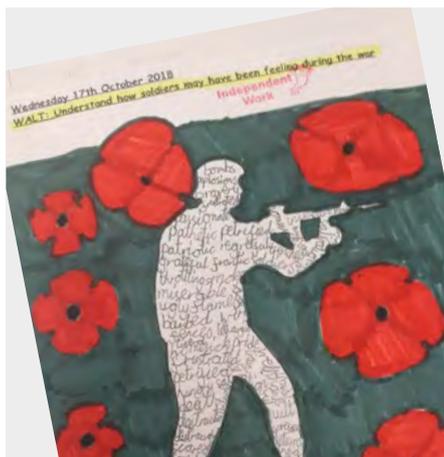


WW1 Trenches Experience

Firstly, the children had to come up with emotions of the soldiers and an outline of the settings using all five senses. To provide the most real, tangible experience possible, the children were given the headsets with the WW1 Trenches Experience loaded up; they then explored the 360 video, focusing on the grime, mud, rain and sobering surroundings. As the video has background audio projecting distant battlefield cries and war zone explosions, the children were given further food for thought and this fed nicely into expanding their choice of language and vocabulary. Whilst viewing the video, pupils were able to ask and pose questions to each other and raise further points to explore in groups and as a class. To codify and bring together this experiential learning, the pupils then removed the headsets and decorated a silhouette of a soldier with words and phrases that could describe what it might have been like to fight in the trenches.

IMPACT ON LEARNING

As 10-11 year olds, they really struggled to step into the footsteps of people that lived over 100 years ago. ClassVR helped the children to engage with the task and gave them inspiration for how to describe the sights, sounds and smells of the trenches. The children were astonished at what the soldiers had to go through even though we had already covered trench life as part of our World War Topic and had a brand new understanding and empathy for the millions of courageous soldiers that gave their lives to fight for this country. This immersive nature of VR helped them think more creatively and their work was imaginative and detailed.



Generation Ocean: Coral Reefs

GEOGRAPHY & SCIENCE Age 11+



Dr. Amanda
Waite



Megan
Hendrickson



ANGARI Foundation &
Academy of the Holy Names,
Florida, USA

Learning Aims:

- To identify corals as animals and recognize their common forms.
- To describe how corals form reefs and understand reef composition and features.
- To explain a coral reef's geographical, societal, and scientific importance.

CONTEXT

Using virtual reality and 360 film, 3D printed and fossil coral specimens and related lessons, students were introduced to corals and reef ecosystems in preparation for a field trip to the Florida Keys. This served as important pre-learning and pre-exposure to these concepts, as it was the majority of students' first exposure to the topic. It helped students understand what to expect in the field, provided a solid foundation for deeper learning, and served as a springboard for discussions about the subject area.

PRACTICAL SESSION



Generation Ocean Video: Coral Reefs



Underwater Playlist

First, students were introduced to corals, the reefs they form, and their local reef tract. The students were then given the opportunity to explore corals and reefs independently through a series of observation-oriented stations. At one station, the students accompanied coral scientists on a research expedition, both above and below water, via viewing of the 360 film *Generation Ocean: Coral Reefs* in virtual reality. The remaining stations asked the students to examine, draw/describe, and identify modern and fossil coral skeletons. The students were asked to compare what they learned of ancient and modern corals and the environmental history of Florida to better understand how Florida coral reefs have changed through time.

IMPACT ON LEARNING

The students were engaged, asked thoughtful questions, and readily drew connections to other topics that they'd covered in their courses. Their lab notebook pages demonstrated a strong attention to detail and accurate application of the introduced coral vocabulary. The virtual reality expedition helped the students understand and anticipate what they would see and experience underwater on the reef. This alleviated student apprehension about entering the water and resulted in a cohort of students that was eager to get into the field and apply what they'd learned. Once in the field, the students were immediately engaged and were able to make coral identifications while snorkelling in an unfamiliar environment.



Introduction to Microbes

SCIENCE/HISTORY Age 10-11



Stephen Coyne



British School of Brussels,
Tervuren, Belgium

Learning Aims:

- To introduce the class to microscopic organisms.
- To recognise the main types of micro-organisms.
- To understand the real-world impact of micro-organisms.

CONTEXT

We work here at BSB with Integrated Learning Themes (ILT) which link all of the traditional foundation subject in a thematic learning approach. This term, Year Six were looking at 'Peace and Conflict', with a focus on World War One and Two, but also with the need to cover the main scientific concepts from the micro-organisms unit of work. These on the surface may not seem to have an obvious link, but with the application of a little VR magic an interesting and exciting bridge between the two can be formed.

PRACTICAL SESSION



WW1 Trench Experience

We had worked a lot with the ideas and themes behind war and peace, looking at various conflicts over the ages including a visit to the site of the historic battle of Waterloo and an investigation into the world's main peace making individuals, but it was difficult to imagine the conditions the soldiers in the trenches of WW1 had to endure. This was where ClassVR came into its own. With one headset per group of three and ClassView on the interactive whiteboard for those without, the children could become immersed in 'World War One Trenches Experience'. After investigating the truly terrible conditions the soldiers had to live through, we turned to the idea that many of soldiers got very sick in these terrible conditions. This was the way we could link the ideas of this conflict with that of our science topic. We discussed that the soldiers were very open to infection from a range of bacteria and viruses in these very unsanitary conditions. Of course, we could not see these microscope creatures so again we used the VR biology section to get close to these tiny creatures, rotating each cell in turn to study its structure.

IMPACT ON LEARNING

The children were very excited and engaged with the system as they felt they were actually in the trench system itself. When they went to work on the task identifying the features of the various micro-organisms in their books they had a renewed enthusiasm for a topic that could had been very dry, if approached in a different more traditional method. The fact that we used this technology as our first lesson on these creatures acted as a great hook on which to hang all our future learning on this topic.



Spanish Vocabulary

SPANISH Age 9-10



Frankie Smith



Granard Primary School,
London, UK

Learning Aims:

- To develop and refine vocabulary and pronunciation in order to describe settings.
- To put vocabulary into context and understand its meaning.

CONTEXT

The idea of this lesson is to allow students to read, speak and familiarise themselves with Spanish vocabulary. As part of our Spanish scheme of work, the children studied a unit called 'La Casa'. In this unit, the children explored objects in the house and how to describe a room; ask questions about a room; and explain and describe the objects. I taught this lesson at the beginning of the 'La Casa' unit to introduce the children to new vocabulary that they would come across. They then used this experience to generate a word bank in their books, which they annotated in English, adding pictures to represent the words.

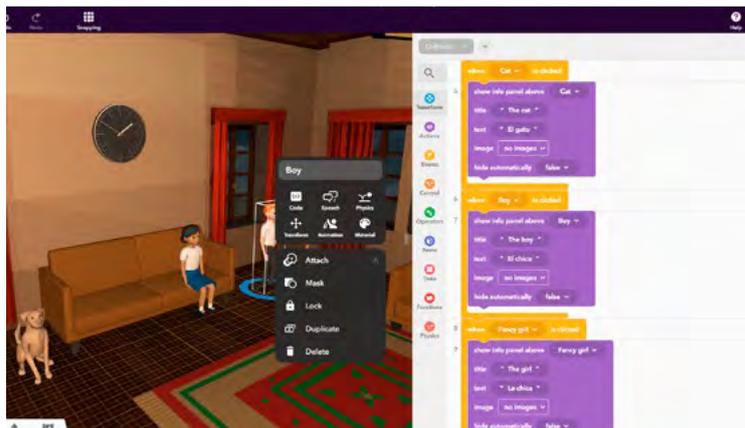
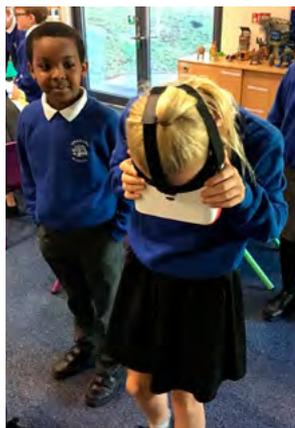
PRACTICAL SESSION



I created a CoSpaces world based on our current unit of work; we created a house with everyday objects that the students might come across. The objects in the CoSpaces world were labelled with both the English and the Spanish. Students worked in groups of three in order to collect, share and use new vocabulary. It also meant that the person using the headset had someone to help guide them around the classroom. The children were free to explore the CoSpaces world at their own leisure. They shared the new vocabulary they discovered with each other and compiled a list of new vocabulary. I encouraged the students to say the Spanish words aloud to their partners. Their partner could then give the English translation (if they've been taught it); guess what the English might be (if they have yet to learn the vocabulary) and/or check the pronunciation.

IMPACT ON LEARNING

Learning a foreign language can be off-putting for some children so this immersive, hands-on approach removed those barriers through an exciting stimulus. They all wanted to take part, have a go and share their new vocabulary with their peers. The children were willing to share what they'd learnt and were excited to support others in saying their new vocabulary. When we did say the words altogether as a class, it wasn't as challenging as the children had seen the words before and attempted to say them. The vocabulary was understood at a deeper level and the children were able to embed and use these words more effectively in following lessons and pieces of work. To be able to put pictures to the Spanish (both written and spoken) meant that all of my students were able to access the lesson and were engaged from the start.



Exploring Spain

SPANISH Age 14-18



Thomas Silva



Stoughton High School,
Massachusetts, USA

Learning Aims:

- To use virtual reality to enable students to explore Spain and its culture.
- To communicate in Spanish with ClassVR.
- To analyze Spanish landmarks and locations.

CONTEXT

Over the semester, we have been learning about various cultural topics of Spain and trying to embrace as much of the local culture as possible. Throughout this, we have used 2D items and photographs, but it isn't as engaging or realistic as a 3D models and 360 imagery. Language acquisition is complex and embracing Spanish in a multi-sensory approach enables students to learn all about the culture, whilst acquiring new language knowledge.

PRACTICAL SESSION



Spain Playlist

To provide students a truly reflective, realistic and immersive perspective of Spain and Spanish culture, we used the ClassVR headsets to explore various landmarks and localities. We started off by visiting the Guggenheim Museum in Bilbao, Spain and I asked the students to describe the sculpture in enough detail for their partner to draw it based on their description. We then analyzed an Easter Procession, investigating the seasonal climate, geographical location and interesting local landmarks. We repeated these questions and lines of investigation for Madrid – the Street of Toledo and the Museo Nacional del Prado. We finished the lesson off by exploring a cave with a bear skeleton and asked the students to describe the place and explain what they found interesting about this to their partner.

IMPACT ON LEARNING

The students were able to cooperatively work together to see amazing sites and locations. The best part was having the other students want to see what their classmate was describing and how the students were able to then apply what they had learnt with ease.



Biological Systems

BIOLOGY Age 10-11



Gabriella Rodolico



University of Glasgow,
Glasgow, UK

Learning Aims:

- To contribute to the School's research performance by conducting and eventually publishing new research on the application of immersive VR in the understanding of abstract concepts in science.
- To support trainee teachers to develop confidence in applying immersive VR and AR technology to their own teaching.

CONTEXT

Very recently, I started to look into the possibility of studying the effect of virtual reality in education, with the aim to analyse the impact that this type of technology has, not only on the understanding of difficult concepts in science education, but also on the learning experience that teachers and students share every day in the classroom and the enjoyment that comes from this mutual exchange. In the last few months, I have started a collaboration with Avantis, and implemented ClassVR in my teaching by planning, in collaboration with my colleagues, some lessons for the PGDE primary student teachers, with a balanced blending of traditional as well as innovative effective pedagogy techniques.

PRACTICAL SESSION



Human Anatomy Playlist

A pit-stop tour of active learning methods in preparation for an on-campus teaching session was organised for our PGDE primary student teachers who, in a meta-level approach, had the chance to test several teaching tools. Pupils moved from traditional peak flow meters and body organ aprons, to innovative augmented reality t-shirts showing the internal organs, and virtual reality ClassVR headsets with an immersive virtual tour around the body. The children explored the different organs and body components available to them in the human anatomy playlist.

The following week, PGDE primary student teachers had to plan a lesson on body systems, in a micro-teaching cooperative style, for the primary six pupils from Corpus Christi Primary School, who were invited to visit the School of Education.

IMPACT ON LEARNING

The results were amazing: we found that it improved engagement and enjoyment of the lesson with pupils being able to richly describe and explain what they learnt; we found that PGDE students were confident in the delivery of the lesson's objectives; and, we found that experiences which would not have otherwise been available, were easy to embed into science teaching and learning.



Making Connections to Current Events

SOCIAL STUDIES Age 10-11



Paige Green



Countryside Elementary School, Barrington, Illinois, USA

Learning Aims:

- To practice non-fiction text reading strategies.
- To strengthen students' ability to make connections to current events.
- To grow literate global citizens.

CONTEXT

My students recently completed a non-fiction, current events reading unit. Shortly after finishing the unit, I was shocked to see the spire above Notre Dame, engulfed in flames, crumble to the ground. This made me think about the opportunity my students had lost. While churning this over in my mind, I had an idea. I could help students unpack this tragic current event, practice their close reading skills, AND still give them the opportunity to visit Notre Dame in all its glory using VR technology.

PRACTICAL SESSION



Notre-Dame de Paris Playlist

Students discussed their prior knowledge on Paris, Notre Dame, and this new current event. Afterward, we created a KWL chart to document what they knew about the event, what they wondered about the event, and what they learned about the news event. I introduced the news article and asked students to read it using close reading strategies. At the end of our discussion, one student said she thought the fire at Notre Dame would be like the United States losing the White House or the Statue of Liberty. Another student stated, "I think people will be sad that they can never see Notre Dame again. Some people there have probably never seen it."

This comment helped me connect my current events lesson to using ClassVR technology. I asked students if any of them had been to Notre Dame and then told the students that they were going to be able to say that they saw it without even leaving the classroom! Each student placed a VR headset on and explored the three different views of Notre Dame. We analysed and evaluated the beauty, significance and history of the building and were able to answer and explore some of the students' key questions using the ClassVR experiences.

IMPACT ON LEARNING

ClassVR turned a current events lesson into a culminating experience; it connected them to the news events in a way that printed word or an online video could not do. Students were able to experience Notre Dame as it was before the fire. Adding virtual reality to my lesson also awoke my students' sense of empathy and helped them to understand this global news event in a more meaningful way. Afterward, a student said, "At least I can now say I saw it!".



Sharks VR

ENGLISH Age 10-11



Laura Obando



Fairview Elementary School,
Fairfield, California, USA

Learning Aims:

- To write a personal narrative/journal entry of a shark experience.
- To use descriptive words to explain their experience.

CONTEXT

Students have been researching sharks from all over the world. We have gone over key words and vocabulary related to sharks and students have then written an informational text about a specific shark and have become shark experts.

PRACTICAL SESSION



Underwater Playlist

I told my students that they will be writing a journal entry on a shark experience. They pretended they were divers looking for sharks. They used what we saw through ClassVR and/or used what we learned so far about sharks. We reviewed key words related to shark life, such as habitat, coral reef, and predator. I then walked students through their first VR experience. I played our first track "Adventures in Nature" and gave students thinking time to consider what they saw in the video. They paired up to share and discuss what they saw. We move on to "Diving with Sharks in Cuba" and "Shark in New Caledonia." This time, students made a list of words (adjectives) that described what they saw. Next, I played the "Shark Experience" track. Students then shared with their group how they felt about what they saw. I gave students a graphic organizer to help them organize their thoughts. The graphic organizer includes: "What I saw", "Adjectives to describe what I saw", "How I felt" and "Vocab words to include." Students also had access to the "Great White Shark" track in case they want to use that shark in their writing. Once they organized their writing, they began to pre-write and ended with publishing their journal entry.

IMPACT ON LEARNING

Seeing and being able to explore sharks underwater truly made this lesson much more engaging for my students. They were able to see first-hand the life of sharks, all from land. My class was very engaged and immersed in this lesson. They were quick to get their thoughts on paper and many students wrote more than they ever had. I truly believe without the VR experience many students would have struggled with this writing assignment. They were able to be creative and very detailed thanks to the VR experience.



Descriptive Writing

ENGLISH Age 10-11



Tamara Letter



Hanover County Public Schools, Mechanicsville, Virginia, USA

Learning Aims:

- Students will use a ClassVR virtual reality experience to enhance their background knowledge about sharks.
- Students will create descriptive writing reflections focused on their senses.
- Students will collaborate with a partner to review, edit, and revise their digital writing.

CONTEXT

Prior to this lesson, students were familiar with using Google Classroom and Google Docs for digital writing. They also had several lessons throughout the school year about how to create a descriptive writing paragraph. This was the first experience students had using the ClassVR virtual reality headsets and their task was to write a detailed paragraph about the day they went swimming with sharks. We reviewed the five senses and how to include three of these senses in their writing. They struggled a bit to write accurately and completely as none had ever been in the ocean with sharks before. We acknowledged their struggles to include details in their writing, then revealed that today they would get an opportunity to virtually swim with sharks!

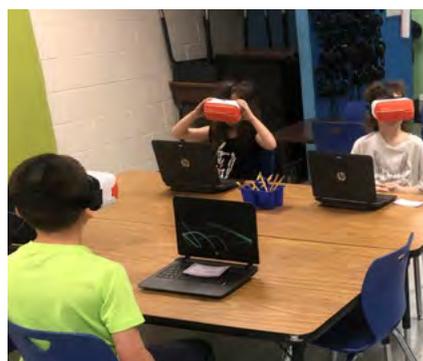
PRACTICAL SESSION

Underwater Playlist

Teaching staff created three senses charts to display on the wall for students to add their insights: "What did I see, What did I hear, What did I feel?". Students then viewed the Shark Experience through their headsets. We focused on exploring their immediate senses and being fully immersed within the moment to ensure they had lots of ideas to use after the VR experience. Following the Shark Experience, students shared their insights as they added descriptive words and phrases to our three senses charts on the wall. Then, students used these insights to add more details to their digital writing stories. In their next lesson, students worked with a partner to read, revise, and edit their digital writing before submitting to the teacher for review and feedback.

IMPACT ON LEARNING

Can students write a descriptive paragraph about swimming with sharks if they have no prior experience of swimming in an ocean or viewing sharks? Possibly, but it would be a struggle, as shown by students in the first part of our lesson. Providing students the opportunity to engage in a virtual learning experience they might never have in their real life, builds in background knowledge in a way that is innovative, powerful and relative. After viewing the Shark Experience, students' curiosity about sharks was piqued. They wanted to not only share their reflections about the experience, but to learn more about sharks living in the ocean, what they ate, and how they lived. By collaborating with others to hone in on specific senses engaged during the experiences, students were able to dramatically enhance their descriptive writing paragraphs.



Student-created 360 Videos

SOCIAL STUDIES Age 10-11



Dawn
Jones



St Andrew's School,
Boca Raton, Florida, USA

Learning Aims:

- For students to engage in an in-depth collaborative inquiry to provide students with the opportunity to synthesize and apply their learning.

CONTEXT

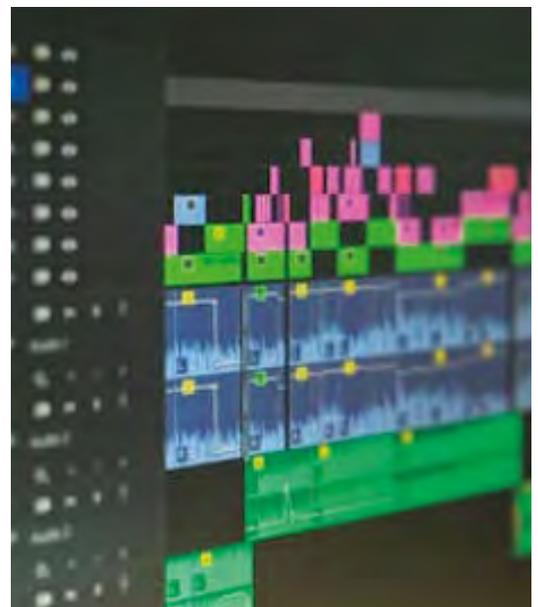
The student group researched why people have stress and anxiety and ways that people can help manage these feelings in many different outlets. The students wanted to showcase what it was like to be at a counselling session. The objective of the lesson was to enable students to choose an area of interest within a central idea and then find a global problem they want to research within the community. The Exhibition is the culminating, collaborative experience in the final year of the Primary Years Program for the International Baccalaureate Program.

PRACTICAL SESSION

As we wanted students to ask questions about the topic they were researching and investigate their own questions, we aimed to create a project which provided a platform for them to take action and create solutions to their line of inquiry. Hence, we purchased the Ricoh Theta 360 video camera and the students used the camera to record their experience from their time at the psychologist office. The student group then edited the video in iMovie and exported the file to the teacher's computer, who placed it in the ClassVR portal. During their Exhibition, in addition to presenting verbal facts to visitors at their Exhibition Table, the students had four ClassVR headsets to give visitors an immersive experience of being at a clinical session. This in-depth, real-life example of psychology in action enabled students to analyze and dig deeper into their own action research project and provided a fantastic stimuli for immersive and multi-sensory learning.

IMPACT ON LEARNING

Students were able to take a typical tri-fold board presentation to an in-depth virtual field trip. Their presentation skills were stretched by adding the ClassVR headset component and the best part of this was that it was totally student-driven! They figured out how to use the 360 camera, used their prior editing skills in iMovie, and then I showed them how to push it through the ClassVR portal.



Interconnected Systems

SCIENCE Age 10-11



Eloise Feltham



Knox Grammar Preparatory School, New South Wales, Australia

Learning Aims:

- To examine how the environment affects the growth, survival and adaptation of living things.
- To define problems and design, modify and follow algorithms to develop solutions.

CONTEXT

Throughout this Year 5 unit of inquiry on 'interconnectedness', students conducted an investigation into living things. They were tasked with the question: How do living things adapt to suit their changing environments? Students began by exploring rainforest biomes and conducting a research project into the different biomes found on the Earth and their similarities and differences. Students researched the human impact on different environments, made future predictions of human impact and explored how animals have adapted.

PRACTICAL SESSION



CoSpaces



ARCube

We explained to the children that they were scientists, interested in the impact humans have on a variety of environments on Earth. They were tasked with researching one particular environment, identifying its key features and classification, and assessing the impact humans have had on that environment over time. We introduced the ARCube and explained to students that they will present their findings through the creation of an interactive ARCube.

CoSpaces was used to design the different perspectives/environments on each of the six sides. Voice overs were used to incorporate English outcomes and sequencing skills. The students followed this broad outline when designing their ARCube: introduction to the rainforest environment, including four biomes and labelled plants and animals; how humans have impacted the rainforest environment; individual research of their own environment (deep sea, coral reefs, deserts etc.), identifying its unique features and outlining why it is important; explaining how the environment has been impacted by humans and/or animals in some way; and finally, students choose one animal that has had to adapt to suit its chosen environment.

IMPACT ON LEARNING

Creating an ARCube engaged all learners, even those with no technological experience! It is a fun, hands-on and interactive platform that allows students to develop and extend their coding skill-base at all levels. It provided students with the opportunity to demonstrate knowledge and understanding at a level appropriate to their needs and is therefore a personalised assessment tool that produced a deeper understanding of content. The impact of utilising Virtual and Augmented Reality in the classroom has contributed to immense student growth in all key learning areas.



Creating 3D Shapes

MATHEMATICS Age 9-10



Chris Bass



Educational Specialist
Avantis Education

Learning Aims:

- To identify 3D shapes from 2D representations.
- To draw shapes using given dimensions and angles.
- To create content using a range of programs.

CONTEXT

Before I started working for Avantis I was a Year Five teacher for three years and I was always looking for new ways to embed computing across the curriculum. One really exciting way to do this is using Paint 3D to create 3D models of shapes that can then be viewed and checked using ClassVR headsets. Giving students the ability to actually create their own shapes using simple computer software deepens both their understanding of the properties of shape and their digital literacy skills.

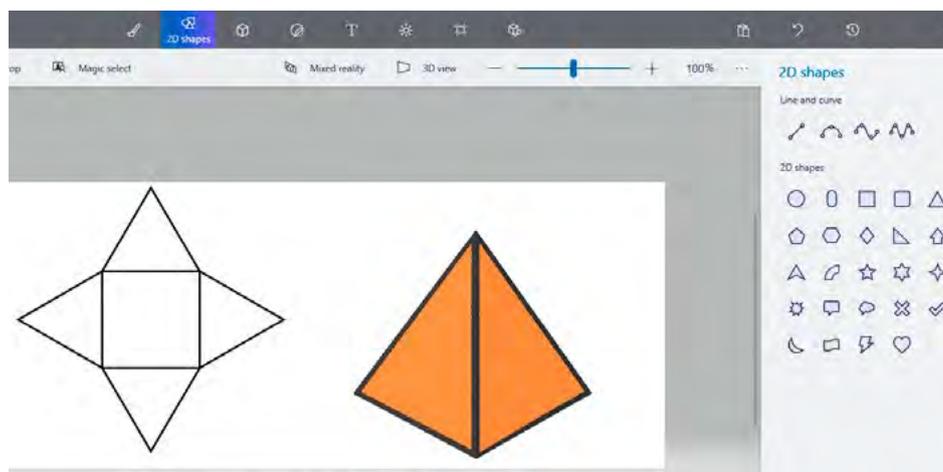
PRACTICAL SESSION



To start this session I talk with students about the differences between 2D and 3D shapes and how they relate to one another. We then look at how a net relates to its 3D counterpart using a printed cube net – I like to use the ARCube net for this, as it can then be used with the resultant 3D models! After introducing the basics of using Paint 3D I then challenge students to create 3D models of some pre-prepared nets. These can be grouped to differentiate for varying abilities or completed in mixed ability pairs. As the students complete their shapes, I can upload them to My Cloud on the ClassVR portal and upload the model directly to them for evaluation. Does it look correct? Is it symmetrical? Do you need to edit it? The students can then use their ARCube to manipulate their creation and study it from all angles before deciding if they need to do any further editing.

IMPACT ON LEARNING

Exploring shape in a new and exciting way using Augmented Reality gives students a broader depth of experience and a greater frame of reference when facing challenges in the future. When it comes to solving problems relating to 3D shapes they will have a tangible first-hand memory of creating shapes from nets. Even more importantly, they are experiencing and using new technologies to help them understand the world and simultaneously improve their overall digital literacy. While Paint 3D is a relatively simple modelling program it can lead into all sorts of other digital forms of expression and allows for creativity in an exciting and innovative new medium.



Minecraft Meets ClassVR

COMPUTING Age 7-11



Mark Savery



Emmanuel College,
Queensland, Australia

Learning Aims:

- To develop digital technology skills.
- To learn how to be a good citizen within a digital world.
- To communicate design ideas for their designed products, services and environments using modelling and simple drawings.

CONTEXT

Students have been invited to join a Minecraft server hosted by the teacher to build individual homes from a central path. The students need to build in a manner which shows how to be a good digital citizen, recognising their footprint and that everything that happens in the world can be seen. From their individual builds, the students then work on collaborative building tasks to construct something for the village to use collectively (for example a park/playground, school, library, supermarket, church, farm/factory business).

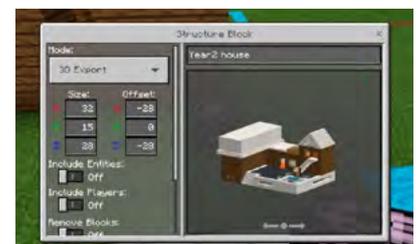
PRACTICAL SESSION

Paint 3D

Within Minecraft, students chose either a house or a building that they built collaboratively. Students used a Minecraft structure block to export their building as a 3D object (Structure blocks in Minecraft). Students opened Paint 3D and using the 3D shape and text tools, students wrote their name with a background rectangle as an embossed plaque on their collaborative build. When finished, students then exported their work from Paint 3D as a 3D object (*.glb file type). These 3D objects were then loaded into the ClassVR Portal and uploaded to the ClassVR headsets and viewed by the whole class (including being able to explore the objects fully through the use of the ARcubes).

IMPACT ON LEARNING

Students were excited to be given building challenges in Minecraft as game-based learning, but they took a further pride and ownership of their creations when they were able to bring their work from the digital world into their physical environment and then manipulate it through the use of ClassVR. Students were able to share their work with other students and staff beyond the Minecraft environment and reflect on their designs, seeing every aspect fully as a 3D object, and collaboratively discussing how they may improve their designs in future builds.



VR Worlds

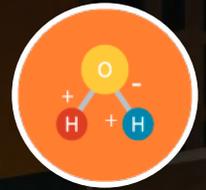
COMPUTING Age 9-10



Laura Woods



Neree Sale



Elm Park Primary School,
Hornchurch, Essex, UK

Learning Aims:

- To create a complex game using code and go beyond tutorials.
- To use skills already developed to create content using unfamiliar online technology.
- To save a document/file in various formats.

CONTEXT

The students explored the virtual world and how it can be used in the classroom. Over a period of six lessons, they built their own virtual worlds using CoSpaces. Some of the key vocabulary we explored in this unit was virtual reality, server, visual coding, z-axis, MP3, cloud, password, virtual world, and story map. Online safety also formed part of the focus and this enabled the students to understand a bit more about file saving and organisation.

PRACTICAL SESSION



Students had one or two headsets on each table. The students began by creating small sections of their own virtual worlds on the desktop application CoSpaces. After students finished each phase of the virtual world, they then scanned the QR code to experience their world and test its functionality; if it had errors, mistakes or could be improved, then they undertook the computational process of debugging – to remove the errors and replace it with fully-functioning code. They also asked one or two other students on their table to view their world and then give feedback on both what they enjoyed and suggestions on how it could be improved.

IMPACT ON LEARNING

Using the virtual reality headsets, the children could immerse themselves in the worlds they and their peers created; this enabled them to improve, critique and debug their worlds in a collaborative and constructive manner. One student commented, *"We have made VR worlds before, but when we used the headsets it made it real. Seeing it I could see what worked and where I needed to make changes and could improve my world."*



Weather & The Seasons

GEOGRAPHY Age 5-6



James Tromans



Prince Albert
Primary School,
Birmingham, UK

Learning Aims:

- To become immersed into different extreme weather scenarios.

CONTEXT

Children had previously looked at the four seasons and what they associated with each season. They had looked at weather and what to expect in each season; we explored simple reasons as to why certain weather is more common at various points in the year and what kind of temperatures, sensations and noises you might hear in the different seasons. This then led on nicely to what might be considered as normal weather and extreme weather.

PRACTICAL SESSION

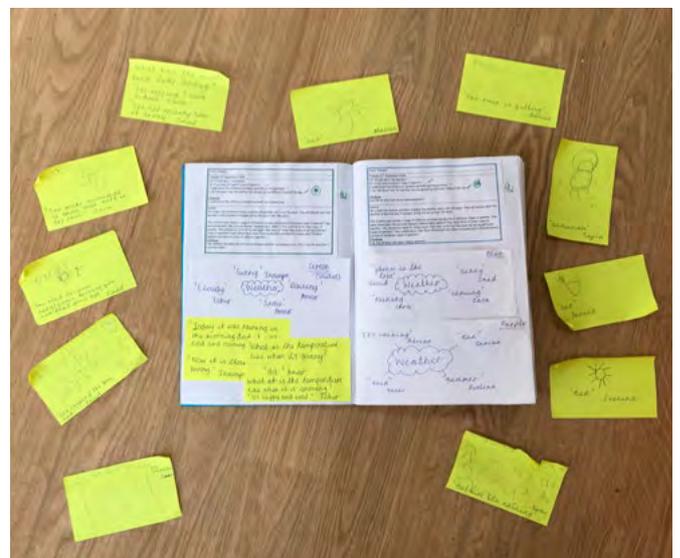


Seasonal Changes Playlist

During the session children were exposed to extreme weather conditions. They were immersed into a tornado and they looked at a frozen gorge and the northern lights. Following each immersive experience, the children were given the time to discuss what they had just seen, how it would have felt to have been there at the time, and what clothes and equipment would have been appropriate for that extreme weather condition. From this the children created a mind map of each immersive experience and wrote down all of the vocabulary that they generated. This then formed the basis of their next Literacy lesson where they used these mind maps to create sentences and explain what they had seen.

IMPACT ON LEARNING

Many of our children will never get to see or experience the extreme weather conditions that they saw using the ClassVR headsets. By using the immersive headsets, the children got a real feel for the weather and through the use of the visual and auditory elements, they were able to accurately describe what the weather condition was like and how it made them feel. The language generated by the experience was far superior to what would have been generated by simply looking at photos or watching a standard video and formed the basis of a fantastic writing stimulus. The ClassVR immersive experience also allowed the teachers to bring to gather Science, Geography, Literacy and Computing into one lesson, creating a cross curricular experience that took learning to the next level.



Happy Places

READING INTERVENTION Age 11-14



Amanda Hunt



Oak Run Middle School,
New Braunfels, Texas, USA

Learning Aims:

- To focus the mind and create a mindful space for students.
- To reduce test anxiety and create visual coping strategies.

CONTEXT

We have students in our reading intervention classes, as well as English Language Learners (ELL), who struggle with test anxiety. I put together what I called a "Happy Places" lesson of places and things in the ClassVR Portal that they could visualize during the test that might help calm some of their anxiety and provide them with coping strategies.

PRACTICAL SESSION



The objective was for students to visit a variety of locations; from the top of a snow-covered mountain, where it's quiet and peaceful, to a sandy beach where they could hear the ocean waves, and many things in between. I organized it by choosing my favorite calming locations and what I thought the students would also find calming and enjoyable.

At the end of the lesson, they had to pick one and discuss or write about it so they would remember it for testing the following week. This process was part of the strategy in encouraging students to visualise a calming place to detach themselves from the immediate feelings of test anxiety. I chose images and videos from the ClassVR library.

IMPACT ON LEARNING

Students never would have been able to have this experience without ClassVR headsets and photos/videos preloaded. Describing something in words or even in a 2D image or video is nothing compared to the actual virtual reality experience. Students feel like they're actually there and this cannot be created with anything else I've used in education thus far. Students were talking about this lesson for weeks. Teachers across the campus came to view and join in and we had students tell us after testing how much the lesson helped with their anxiety when they got stuck. They didn't panic like usual, but imagined their "happy place" and were able to continue on with the test. That's all the proof I needed to show how important and vital this lesson was and what an impact ClassVR has on our students, campus, teachers and myself in the library.



Jacobites

HISTORY Age 9-10



Simon
Luxford-Moore



ESMS Junior School,
Edinburgh, UK

Learning Aims:

- To understand the key events of the Battle of Killiecrankie.
- To show a basic understanding of different types of historical evidence and bias.
- To understand how the Jacobites' defeat at Culloden impacted on Scottish life/culture.

CONTEXT

Video and still footage was taken at Killiecrankie at the site at which Donald McBane allegedly leapt 5.5 metres across the raging River Garry whilst escaping his Jacobite pursuers. I also visited Culloden Battlefield and took footage of the Memorial Cairn, the Jacobite and Redcoat lines, the crofter's cottage which was commandeered as a field hospital for the British troops and the battlefield itself to highlight the terrain. Children read the story of the battle(s) and discussed the order of events.

PRACTICAL SESSION

After reading and discussing the battles (individually) and gaining an understanding of events, the headsets were introduced to help reinforce key points such as the distance between the two lines of armies at Culloden and how the famous Highland Charge would need to be maintained for some distance over heather moorland before reaching the organised ranks of Redcoat artillery and infantry. Children were then invited to add more thoughts to their discussion points, mindmap and plans, based on experiencing the actual battlefield, including the sound of the wind over the moor. This deepened their appreciation for the stamina involved and, based on how tired the Jacobite troops were from their forced march through the night, how their charge was futile. This is also the case with the Soldier's Leap video footage. As an extension, groups were invited outside to see how far they could leap, as if pursued by soldiers, and then discuss the enormous difficulty in jumping 5.5 metres. The discussion on bias and early propaganda can be raised here and children can debate the feasibility of Donald McBane's efforts.

IMPACT ON LEARNING

Children gain a far deeper understanding of the events having 'witnessed' the conditions first hand and seen the terrain which is not clear in textbooks. So too with the "Soldier's Leap" in which the actual distance is far more realistic with the headsets than from an account in a book, or a diagram. Seeing the river rushing by between the rocks adds a whole level of appreciation, or disbelief. Importantly, every child enjoyed the lesson because of the enhancement from the headsets and therefore will better understand and remember the learning outcomes.



Virtual Reality Tour of Our School

CROSS-CURRICULAR Age 10-11



Susie Grant



Brooklands Primary,
London, UK

Learning Aims:

- To experiment with new technologies.
- To use the technology to aid writing.
- To take responsibility of the new technology and share with the younger students.
- To describe the setting.

CONTEXT

The overall school topic was "This is me. This is us!" The class were asked what this title meant to them and we decided to make a virtual tour of the school, which tied in with our Design and Technology project. In DT, the class were making different sections of the school; each group were given responsibility of a specific section. The class were introduced to the ClassVR headsets, and they were used to aid a descriptive piece of writing. This piece of work sparked their interest around the headsets, so we wrote instructions on how to use them and even used ClassVR for a still life drawing.

PRACTICAL SESSION

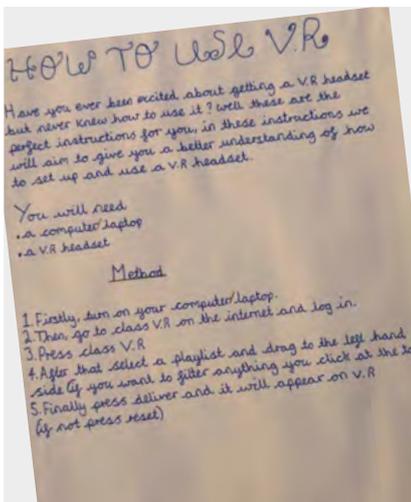
Ricoh Theta

The class were shown the 360 camera, and the Theta app. As a class we took a picture and talked about the process.

We discussed how we could make the picture better; for example, using the tripod not our hands for stability and greater focus, hiding so we weren't in the picture to give the image a professional look, and positioning the camera in a sensible part of the room so it captures all corners and sections in as much detail as possible. Each group had a go at taking the pictures and using the device to capture various parts of the school. We then came back together to share some of the images the children had captured and were able to share these images as a Playlist on the ClassVR Portal and headsets.

IMPACT ON LEARNING

It was important for my class to see that all the small parts combined together made something which everyone was impressed by. The children loved seeing the VR map next to their models at the showcase. They really enjoyed showing their work to the other classes, which allowed every class to experience the school tour. They have really enjoyed using the headsets and their engagement in the task was increased because of the active nature of the image capture, but also from appreciating their own collaborative VR tour.



Inside “El Quijote”

SPANISH Age 15-18



MariSol Padilla



New Braunfels High School, Texas, USA

Learning Aims:

- To understand and comprehend Spanish texts.
- To describe settings, characters and atmosphere skilfully.

CONTEXT

In my Advanced Placement Spanish Literature and Culture course, students are required to tackle a large quantity of required readings in the target language. An example of this is the required chapters to be covered from Miguel de Cervantes’ *El ingenioso hidalgo Don Quijote de la Mancha*. It is a daunting task for teenagers to read and interpret literary works in archaic Spanish. As such, being able to incorporate virtual reality experiences such as those available in the ClassVR Library, combined with outside sources that I have found on my own and uploaded into my portal, allows me to customise my anticipatory set to really bring to life the world that inspired Cervantes’ great masterpiece.

PRACTICAL SESSION



Padilla / Cervantes Playlist

We began by immersing ourselves in the whimsical surroundings of authentic 360 degree photos from certain Spanish cities. We were also able to view a 360° 3D video narrated in beautiful Castilian Spanish inside the prison cell that is claimed to be where Cervantes created his work! Once the class had finished going over the “Códigos” (pre-reading discussions designed to provide historic and cultural background and insight into the works before we read them) I led students on a VR journey as described in my article. I then took my class amongst the windmills of La Mancha – another amazing VR experience – which truly enabled them to feel, see and appreciate a part of the landscape.

IMPACT ON LEARNING

To be able to take my students to the sites that inspired Cervantes truly piqued their interest in the subject and allowed them to more effectively internalize the challenging work of *El Quijote*. It should go without saying that this type of experience is beyond my wildest dreams of what I thought possible when teaching a unit on 17th century Peninsular literature. Breadth of descriptive vocabulary in the target language increased in both content discussions and essays.



Polar Exploration

SCIENCE & COMPUTING Age 9-11



Emma Hardy



Exning Primary School,
Suffolk, UK

Learning Aims:

- To understand how creatures have adapted to their habitats.
- To be able to explain why certain features are crucial to surviving in challenging environments.

CONTEXT

We start every topic with a 'sparkling start' to engage the children; for our 'Explorers' topic, we used the ClassVR headsets to look at different environments to immerse the children in such a way that they could really explore and compare each setting. The children followed the journey of the Nimrod expedition, using the interactive map and using the links to the actual photographs, artefacts and diary entries. Equally, with the Terra Nova expedition story, we were able to captivate their children's interest in comparing Robert Scott's survival kit with that seen by a modern day explorer.

PRACTICAL SESSION

Gentoo Penguins in Antarctica

Linking to our science 'Evolution' topic, we explored the Gentoo penguins project video; this enabled the children to see the penguins in their natural environment and analyse their surroundings, behaviour and habitat. We challenged the children to identify features of the penguins and how these support their habitation in such a cold and tough environment. In addition, we then used CoSpaces to create our own Antarctic world – focusing on the environment features which would be appropriate for this setting and using the coding options to incorporate computing into the science-led topic. The children then created their own creature and added it to the Antarctic setting which they had earlier created. The children were then able to use CoSpaces' share feature and provided collaborative feedback to each other about the science and computing within their projects by viewing and experiencing their worlds and creatures through the ClassVR headsets.

IMPACT ON LEARNING

These resources brought the explorations and expeditions to life for the children and removed many layers of abstraction from their learning to give them a more tangible grasp of these huge, mammoth events. Further to this, the headsets supported children in moving their learning forward by giving them the access to view and unpick environments which they and their peers had created. Their level of enthusiasm, engagement and resilience in this topic was greatly increased and we were very impressed with the children's retention and ability to apply their understanding across the board. The high levels of cognitive engagement and achievement during the topic would not have been possible without these amazing new opportunities provided by the digital technologies.



Creating in CoSpaces

COMPUTING Age 5-7



Sheela Yadav



Grange Primary School, Harrow, UK

Learning Aims:

- To create a 360 degree virtual space.
- To be able to use computational thinking, algorithms and debug code.

CONTEXT

Students were exposed to virtual reality for the first time during their lesson on 'Space'. They had the experience of viewing the individual planets and the solar system as a whole in 3D. These experiences facilitated the students to better understand the concept of space. During these lessons one of the students curiously asked, "We are actually not on the moon but how, just using this headset, can we see and feel as if we are on the moon?" This led to explaining what programming is in computer language and made the student even more curious thinking that what he is seeing is actually possible to create.

PRACTICAL SESSION



I asked the children to go onto the CoSpaces gallery and explore some of the pre-published creations; in conjunction with this, I also copied some of the links onto the ClassVR Portal, so students could view the example creation via the ClassVR headsets. The students' ideas of creating space started to change and they wanted to create different worlds with different foci. I gave the VR Club support in getting themselves registered and then, after this point, they were left to explore all the tools they had and how to use them independently. Initially, they were tasked with coding their characters/objects to move and speak. This was challenging for some of them, as one student explained, "I want this witch to speak but it is not working!". Students were introduced to the concept of 'debugging' and how important it is to check the steps they were taking to perform the desired action. At this point, I asked them to share their unfinished creation with me and I showed their work via a ClassVR headset; they explained why they chose that specific world, how they created it and what they wished to add further. Some students wanted to move two objects at the same time, e.g. a car and the sitting man, a boat and a man standing on it. This was set as their homework to find out how to get two algorithms running concurrently.

IMPACT ON LEARNING

The students learnt how a 3D world can be created and then shared with their peers. They felt that they could be teleported to any world through their imagination and hard work, without having to even leave home/school. They learnt to solve complicated problems through reasoning and that if the sequence in coding is not correct, then the desired action is not accomplished. The use of the headsets provided a platform for the children to publish their work on and enjoy experiencing other children's work too.



Lines & Angles

MATHEMATICS Age 14-15



Terri Gogola



Franklin High School,
Livonia, Michigan, USA

Learning Aims:

- To identify a line and a shape (i.e. circle, square, triangle).
- To identify the attributes of lines e.g. circles, and angles with equitant measure.
- To identify the attributes of perpendicular lines, parallel lines, and lines segments, angles, and circles.

CONTEXT

To begin this sequence of learning, we reviewed posters on different angles and lines to remind the students about key terminology. Then, we explored angles and lines around the classroom to enable students to have a tactile, first-hand experience of these concepts. Afterwards, we extended this to exploring for angles and lines around the school.

PRACTICAL SESSION



Angles, Lines & Modern Buildings Playlist – Community Library

We began the session by reviewing the angles and lines posters; we then launched the lines and angles ClassVR playlist. To encourage students to apply their understanding, we had them find lines and angles on the projected architectural buildings on the board. Using digital ink and dry erase markers, we identified the different lines and angles on the projected buildings. Afterwards, the students put the ClassVR headsets on to explore all the lines and angles in the virtual world. We used the dynamic point of interest to help facilitate the group in the experience while collaborating about the different lines and angles in the 360-degree experience.

IMPACT ON LEARNING

The students were 100% engaged during the entire lesson on lines and angles. They love using the ClassVR headsets to enhance their learning experiences. The verbal communication and collaboration that took place throughout the lesson was incredible!



The Science of Flight

PHYSICS Age 11-13



Red Arrows



Red Arrows Royal Air Force

Learning Aims:

- To identify the forces affecting an aeroplane.
- To describe forces using force diagrams.
- To create virtual reality experiences based on prior learning.

CONTEXT

A big aim of the Royal Air Force Aerobatic Team is to inspire the next generation - potential future pilots, engineers and technicians. The Red Arrows is one of the world's premier display teams and has provided great footage from inside the cockpit to ClassVR. This offers a fantastic opportunity to bring the science of flight to life. This lesson will require a moderate level of digital literacy and a core understanding of CoSpaces - the ability to create an environment, add objects and code them using block coding or Javascript will be required to get the most from the session.

PRACTICAL SESSION



Red Arrows Video



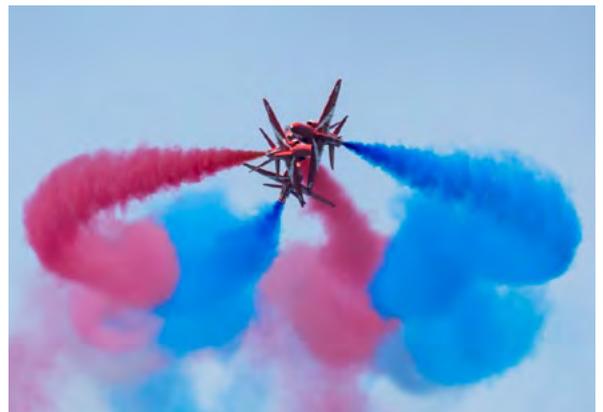
CoSpaces

This session explores the key forces that are involved in flight, specifically when looking at the Hawk jet used by the Red Arrows. To begin, use the ClassVR portal to play the video and discuss with students how they think the plane is able to stay in the air. This is an assessment opportunity for prior knowledge and a great time to discuss the forces in play on a plane in flight - thrust, drag, lift and weight. After explaining and demonstrating these forces, introduce students to the 3D model of the jet and ask them to identify key features of the vehicle, as well as any specific design aspects which make them aerodynamic and fit for purpose.

Afterwards, introduce the students to the CoSpaces website and instruct them to create and code a working model of a Hawk jet with accurate labels to demonstrate their understanding. Students with a more advanced understanding of coding can create an interactive model that changes based on the forces acting upon it using more advanced variables from either the CoBlocks or Javascript options. Finally, use the CoSpaces app within the ClassVR portal to explore the students' interactive models and collectively debug the code that was used.

IMPACT ON LEARNING

Using a tool like CoSpaces is an incredible way to help embed learning into a students' long-term memory - by experiencing the content directly through virtual reality footage and then creating new content to explain key concepts. In doing so, students are using advanced cognitive recall techniques that give a genuine, first-hand memory to draw upon when they need to either remember a specific topic or build upon their knowledge later in the year.



Fairy Tales

LANGUAGE AND LITERACY Age 5-6



Simon
Luxford-Moore



ESMS Junior School, Edinburgh,
UK

Learning Aims:

- Support understanding of specific fairy tales beyond simple visualisation by experiencing the stories as one of the characters.
- Recount (verbally or written) the tale from a character's point of view, using emotional and descriptive vocabulary.

CONTEXT

Children are visited by a fairy tale dragon, who leaves behind a mysterious note. The letter explains that all the fairy tales are under threat because people have stopped believing in them and have stopped sharing them.

The children are asked to help by reading classic fairy tales and then 'visiting' them to help share the tales with others.

PRACTICAL SESSION

There are a few ways to enhance learning with VR, depending on the dynamics of the class. The headsets might be used to explore the fairy tale in *Avantis World* first and let the children roam free to work out what the fairy tale might be, given clues in the setting. Alternatively, visit the fairy tale scene after an introduction to compare/reinforce/challenge what the children are sharing with you. It can also be used as an effective plenary. At whichever point the VR headsets are used, consider the following:

Read the story as a class and invite the children to imagine what the scene or objects within it are like. Talk about what it would be 'as big as', or how it would feel to hold/touch. What smells might they notice? And, importantly, reinforce how they might feel to be there, or be that character. There are lots of opportunities to enjoy this lesson with Drama too.

Some children may find this visualisation challenging and require a 'visit' with the headsets early on, but ensure there are opportunities to discuss what they see, hear, feel (physically and emotionally), and help foster a deeper empathy for a chosen character. Thoughts and experiences can be shared afterwards and a structure for presenting their argument (verbally or written) to their audience on why fairy tales need to be enjoyed and shared, can then be formed.

IMPACT ON LEARNING

Using VR effectively always gives learners an emotional and experiential connection with what they are learning. It is far easier for someone to discuss and share what they have experienced than what they read about, as they can refer to their senses better. Giving children an opportunity to experience a fairy tale in *Avantis World* and see objects like Jack's beanstalk in a scale beyond a 2D picture in a book, is very powerful. Children enjoy this activity and are enthused to engage more in their learning of literacy and appreciation of stories.



The Human Body

BIOLOGY Age 10-11



James Tromans



Heathfield
Primary School,
Birmingham, UK

Learning Aims:

- To have an awareness of the different parts of the human body.

CONTEXT

This was the children's first lesson in their Science topic – The Human Body. The idea was to immerse them in learning which would hook their interest in how various parts of the body functioned and worked. The medium term plan was make sure the children understood exactly why certain parts of the body were designed in such a way and how the shape, size and structure of different aspects of the human body contributed to a healthy human being.

PRACTICAL SESSION

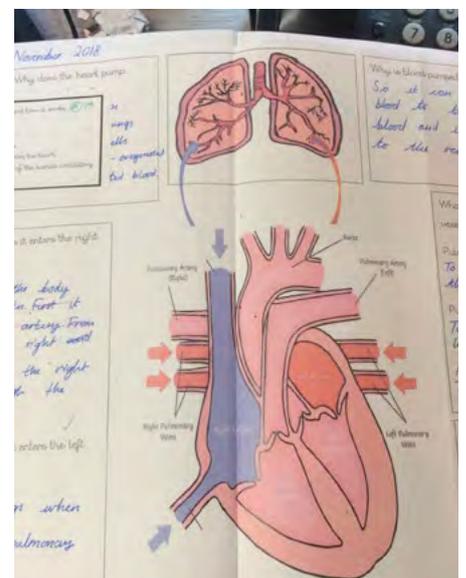
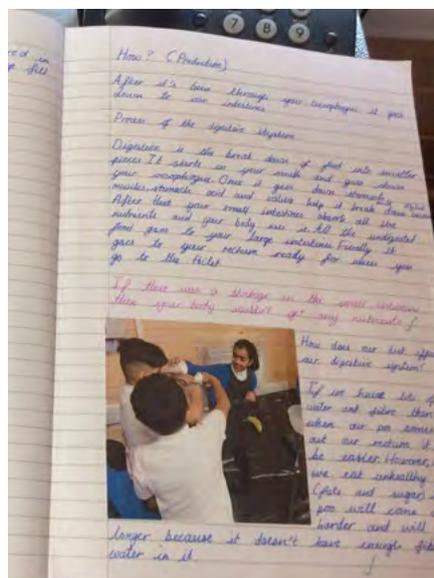
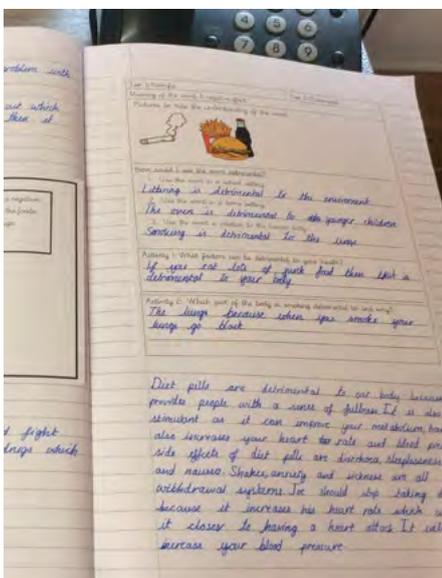


Human Anatomy Playlist

During the session, the children were given the opportunity to take a 360-degree virtual tour of the human body using the ClassVR headsets. We used the Human Anatomy Playlist to explore different sections of the body and provide a detailed view of body parts for the pupils to interrogate and ask questions about. Following the experience, children wrote down as many body parts, facts, questions and key words that they could, based on what they had experienced. For example, we looked at how the skull was shaped and structured to provide protection to the brain; we also looked in more detail at how the skeleton was formed to provide protection to the vital organs within the torso.

IMPACT ON LEARNING

This VR experience formed the starting point to their topic. It generated questioning, which allowed the teacher to tailor future lessons to meet the children's needs. It exposed students to language that they might not have experienced normally and gave the children the chance to explore the human body in a safe and purposeful way. Following this lesson, the children then explored the heart in more detail using the ClassVR headsets, looked inside a beating heart and explored its job within the body. This was the perfect starting point for the heart dissection that took place the lesson afterwards, as children already had an understanding of the heart's role, and what they should expect to see inside it.



Submarine Inquiry

KINDERGARTEN Age 5-6



Brittany Korstanje



Kinnowood Central Public School, Forest, Ontario, Canada

Learning Aims:

- To inquire about and understand underwater life, habitats and materials.

CONTEXT

Our students' next inquiry was to learn about sea creatures. We left out books, pictures and provocations / learning invitations. They discovered different types of water transportation, such as submarines, and how marine biologists research aquatic habitats. Some students requested to go scuba diving and others were determined to build a submarine. We gathered building materials but realized we did not know how a submarine was actually built.

PRACTICAL SESSION

Submarines Playlist

We viewed an image of the inside of a submarine. The students came up with lots of wonder questions after seeing so many panels, buttons and tanks. They sketched out what they saw, wrote down their questions and worked together to discover answers. They recorded their findings in their digital journal (e.g. the radar keeps track of objects under water, the ballast tank fills up or releases water so it will sink or float). Once the students constructed a radar, navigation system, and a ballast tank (made from everyday items), they were ready to submerge underwater and discover sea life up close.

Our class eagerly grabbed the VR headsets and we sent them on a Fish and Coral expedition. We discussed what they saw (e.g. how many sea creatures). The meaningful math conversations were exciting to observe. Next, students began plotting sea life they saw virtually onto their "radar" grid paper. We later asked students where different objects were on the radar to assess their letter/number recognition as well as their spatial awareness and comprehension of finding coordinates (e.g. "I see a scuba diver on B11").

IMPACT ON LEARNING

We believe this VR technology was the perfect learning tool to extend our students' thinking and promote analytical thinking. ClassVR engaged and inspired every student in our learning community. It added a third dimension to their learning experience that they could connect with and become inspired by. This technology sparked meaningful dialogue and brought our young learners together. As educators, we were excited to see so many FDK curriculum expectations and framework areas being addressed throughout these virtual reality expeditions.



Estimation and Prediction

MATHEMATICS Age 5-7



Simon Pile



Anson Primary School,
London, UK

Learning Aims:

- To be able to accurately estimate using a range of mathematical strategies.
- To be able to analyse 3D objects and name their composite shapes based on the object's properties.

CONTEXT

As part of our mission to embed virtual reality across the curriculum, we have begun to use the technology to create opportunities for independent exploration and creative mathematical thinking. Geometry, estimation, prediction and logical reasoning are all key areas of mathematics and we wanted to stretch our pupils' reasoning through contextualised, VR learning.

PRACTICAL SESSION

Estimate and Count Playlist

Within a mathematics lesson, we used a photograph of a celebration of light from China and asked the children to begin by looking for different shapes within the lanterns. They were able to zoom in and de-construct the shapes by moving around the 360 image and thoroughly examining each lantern from various angles. We then wanted to move the children's learning on, and as such, we asked them to identify different composite shapes within the image and within larger objects. This involved the children applying their understanding of shape and geometry to a variety of objects and then explaining how and why they have reached their decision. We encouraged the children to explain their strategies and thinking, so as to deepen their mathematical reasoning and also choose different objects within the image independent of our guidance. Afterwards, we asked the children to estimate the number of lights within the image and discussed how they could methodically and systematically have found an answer to this – again, scaffolding their deeper reasoning and higher order thinking skills.

IMPACT ON LEARNING

As an immersive mathematical experience, it is very powerful and also means that you are encouraging students to think about the world around them in different, creative and explorative ways. In doing so, we found that having these opportunities then fed into students applying their mathematical understanding within their social times and across a wide variety of subject areas. The impact of this meant that the children were constantly re-applying and re-visiting their mathematical skill base, because of having had the opportunity to apply their knowledge and understanding in such a fun and unique context.



Fly, Eagle, Fly

ENGLISH Age 7-8



Michelle Quinlan



St Stephen's CE Primary,
London, UK

Learning Aims:

- To engage reluctant writers.
- To increase the range of powerful vocabulary.
- To apply the powerful vocabulary to independent writing.

CONTEXT

Our Literacy learning was focused on stories with a moral. We had been reading 'Fly, Eagle, Fly' and were beginning to think about writing our own story with a focus on setting description. To inspire our own writing, we looked at the description of the Farmer and his friend climbing the mountain at the end of 'Fly, Eagle, Fly' - and what they saw below. The plan was for us to rewrite this description (and the ending of the story) with the children using powerful vocabulary and noun phrases to describe scenes from different countries in Africa.

PRACTICAL SESSION



Africa Playlist

The children were in groups of three with one headset per group. I had created a playlist of photos and videos from different countries in Africa. Each member of the group had a different job; one child wore the ClassVR headset and used adjectives and nouns to describe what they saw; another child listened to the description and wrote down (on a provided template) the nouns and adjectives the first child said; the third child had a thesaurus, with which they would look up the adjectives that had been written down and find powerful synonyms. After a few minutes of the children talking and using the thesaurus, I sent the headsets to the waiting room. They would then work in their group to use the new synonyms to form a noun phrase to describe things that they saw in the picture/video. We shared them as a class. The children then swapped jobs, looking at a different photo/video and creating more noun phrases to add to our working wall display.

IMPACT ON LEARNING

Every child was engaged, enthusiastic and achieving. The range of language used during the session was excellent and promoted great discussion on the effectiveness of different words to convey the right meaning. In particular, one reluctant writer, who had previously not been able to produce more than about half a page of writing due to his limited vocabulary, was extremely vocal, engaged and excited about describing what he saw. The piece of writing straight after that lesson involved applying those noun phrases to a new setting description and he did so independently and with pride - writing over a page and a half - which I put down to his enthusiasm from the headset session!



Early Communication

EARLY YEARS Age 3-4



Rebecca Combes



Fleet Primary School,
London, UK

Learning Aims:

- To begin using more complex sentences to link thoughts.
- To use talk to connect ideas and explain what is happening.
- To build up vocabulary that reflects the breadth of their experiences.

CONTEXT

This lesson took place in a nursery class of 23 children aged three to four; there is a high proportion of English as an additional language and bilingual pupils. Our baseline assessments demonstrate a low entry level for most children in communication and language skills; as such, we decided to incorporate as much visual and immersive learning as possible to support and accelerate the children's language skills.

PRACTICAL SESSION



Giraffes at Riga Zoo

In pairs, the children looked at a photograph of some giraffes and talked about what they could see. I then introduced the headset with the track preloaded and ready to use. One child wore the headset and described what they could see using the Giraffes at Riga Zoo image. They then swapped over so their partner could see what they had been describing and talked about the image further – using descriptive language and predicting what was actually happening.

IMPACT ON LEARNING

The initial photograph led to some statements, such as "Look...a giraffe!" and "It's big" but the conversations were quite limited and short, and vocabulary was not developing as a result of the activity. When the headset was introduced, the children were more stimulated to say what they could see. It led to more imaginative vocabulary, expressive statements and extended sentences.

Child 1: "I can see a man, no...two mans. They are actually feeding the giraffe. There's another man. He has a green t-shirt on!"

Child 2: "I see a giraffe. I'm scared of it! It's big! It's going to eat me! I see the audience too!" This child was referring to the people in the image. This discussion led to finding out more about giraffes and what they eat – luckily not nursery children!

Child 3: "Wow! I see a human. That's a big giraffe! More humans! I'm on the ground but I'm not on the ground! The giraffe is looking at me and fooding (feeding). They look great!" The children loved using the headsets; feeling around them for the objects in the image and even exploring how to control them – one child worked out how to move the image by tilting his head, "It's like a steering wheel on a car!"



Bringing History to Life

HISTORY Age 8-9



Simon Harris



Ardleigh Green Junior School, London, UK

Learning Aims:

- To identify similarities and differences between ancient civilisations.
- To answer, create and evaluate historically-valid questions about ancient civilisations.

CONTEXT

This session served as a springboard and initial introduction for a teaching sequence focused around historical sites of ancient civilisations. The objective was to make sure pupils were able to explore both the human and physical comparative points between various ancient civilisations and appreciate how they developed in different ways. We wanted the children to be able to compare, contrast and understand what an ancient civilisation looked like and how people of the era might have lived.

PRACTICAL SESSION

Ancient Maya

Taking turns, the children described what they saw and as a class we talked about how each civilisation was different in terms of technology, resources and sophistication. Using the focus tool to draw children's attention to specific areas of the VR experience allowed greater understanding in discussion. For instance, we were able to really interrogate the North Acropolis, Tikal, discussing specific parts of the structure, what it was used for and encouraging the children to hypothesise and predict whilst immersed within the experience. Being able to see what and where the children were viewing directed the discussion and led onto more structured, tailored and specific questions.

IMPACT ON LEARNING

Having a virtual experience of the Mayan sites, the children had a better understanding of that civilisation and its place in history; it allowed them to see exactly what it was like to stand next to a Mayan temple. The experience provoked discussion amongst children of all abilities and allowed them to describe and discuss their experiences of what they saw and how they felt because of the 3D images and artefacts they experienced. This provided a first-hand, experiential approach to learning, which enabled a deeper understanding of the topic we were studying.



Investigating Cells

SCIENCE Age 14-16



Susan



Rebecca



Irmo, Richland,
South Carolina, USA

Learning Aims:

- To introduce parts of a cell at the beginning of a unit on the parts and processes of a cell.
- The goal was to help students visualize microscopic particles that cannot be seen readily by the human eye.

CONTEXT

At our high school, the Digital Integration Specialist (DIS), Susan, co-planned with a STEM biology teacher, Rebecca, to determine what videos and/or photos would be best to use. Because this was designed to review cells with students, we found and imported a 360-degree video of an animal cell. We had seven different biology classes with three different teachers participating over the course of two days. Before each class arrived, the DIS had content loaded on the headsets and placed them at each table. Each teacher brought his/her class in for about 35 minutes.

PRACTICAL SESSION



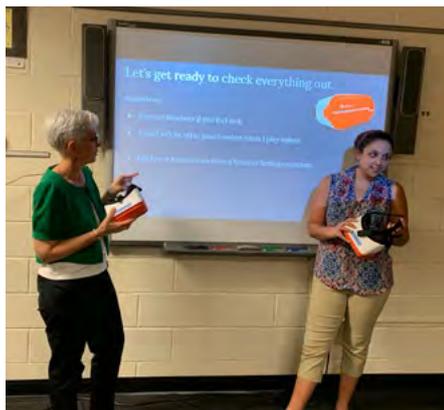
Animal Cell 3D

The DIS first reviewed a brief Google Slides presentation about the content we'd be viewing and the purpose of the day. At their tables, the students then drew and labelled diagrams of a cell and listed as many organelles as they could. We reviewed these organelles together to help anticipate what they would be seeing.

We first showed the video without sound. This was an intentional choice to let students see the parts of the cell and make an educated guess about the parts they were seeing. While the DIS handled the technology and troubleshooting, the biology teacher would ask the students questions. We also paused and used the ClassVR program to focus the students in on a particular part of the scene such as the Golgi apparatus (using the "dynamic point of interest"). Once we had been through the video without sound, we took the headsets off for some more reflection and discussion. In pairs, students shared what were the biggest/smallest organelles they had seen, which ones were moving, and what else they saw. We then reviewed as a whole class before watching the video again with the sound on so they could hear the narration. To conclude we let them independently look at the Animal Cell 3D model from ClassVR.

IMPACT ON LEARNING

Viewing the animal cell from the inside gave the students a clear picture of things that are normally too small for them to ever see. This activity helped them understand the different parts of a cell and how they move and work together. Being able to see the organelles in 360 made them come alive for the students and introduce them to the unit on cells. Next year, we plan to use the cell video both to introduce and review the unit on cells.



Underwater Exploration

GEOGRAPHY Age 6-7



Anna O'Connor



Beatrix Potter School,
London, UK

Learning Aims:

- To be able to use adjectives to create a descriptive paragraph about what a character sees under the sea.

CONTEXT

The children had completed a series of lessons on *The Snail and the Whale* by Julia Donaldson and had been focussing on using imaginative adjectives to describe a scene. Part of the unit of work was based around expanding their vocabulary and use of synonymous language to improve the coherency and fluency of their writing.

PRACTICAL SESSION



Underwater Playlist

At the end of a sequence of teaching *The Snail and the Whale*, our Year 2 students used the VR headsets to explore a range of underwater scenes from around the world. Through this experience the pupils were able to apply the adjectives they had generated in their previous lessons to a real life setting. The children used the headsets in pairs; partner A put the headset on and told partner B what they could see, partner B scribed what partner A said and then they swapped tasks. We were amazed by how much vocabulary the children were able to use and how they were able to build upon the language they had already acquired. Because the children had immersed themselves in the setting they were writing about, we found that they were more able to apply the new vocabulary they had acquired, for example "shimmering, glistening water", "majestic, large shark". A key feature in this lesson was being able to direct the children's attention to a specific point in the scene. This allowed children to focus on one object at a time and the teacher to direct the discussion.

IMPACT ON LEARNING

The children then wrote a descriptive paragraph about their experience under the sea using the vocabulary they had curated after each session on the VR headsets. Class teachers commented that they were so impressed by the willingness of some reluctant writers to use challenging adjectives in their writing and felt that their class had a better understanding of their vocabulary because they were able to apply it to a real life situation. The richness of the writing was evident when it was compared to a similar piece of writing completed by the pupils without the use of the ClassVR headsets.



Magnificent Desolation

PHYSICS Age 9-13 



Phil Birchinnall



Senior Director of Immersive Content
Discovery Education

Learning Aims:

- To understand the difference between mass and weight.
- To understand the relationship between gravity and weight.
- To calculate weight in newtons.

CONTEXT

'Beautiful, beautiful, magnificent desolation' Buzz Aldrin's description of his impression of the lunar surface is not as iconic or as remembered as Neil Armstrong's 'one small step...' As a child, I watched the moon landings and was in awe of the astronauts, bouncing around the surface of the moon, seemingly effortlessly and with such grace (with the occasional mishap). That powerful experience made me question what was happening. Why were they walking like that? When we created our first lunar VR experience with full physics emulation, I couldn't wait to have my virtual moment on the moon! Now, let's figure out why things are so different on the lunar surface and how would it be to walk on the planets of our solar system!

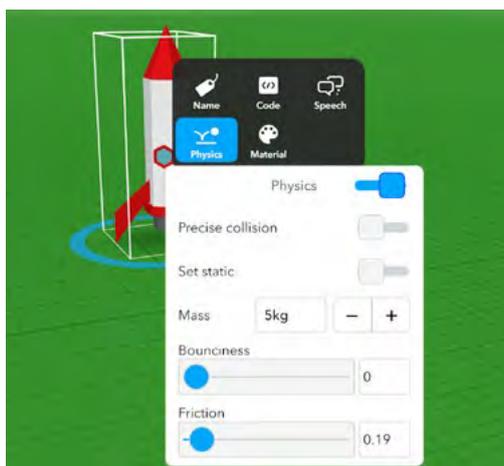
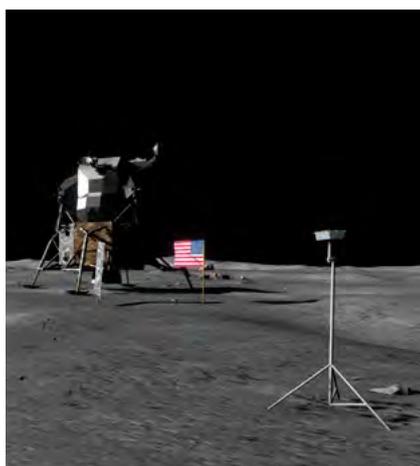
PRACTICAL SESSION

CoSpaces Physics Engine

Allow students to virtually walk on the moon inside ClassVR Space Adventures or LunarVR. Talk to the students about how they moved around the surface and how different it was. Students should be made aware of the difference between weight and mass, as well as the relationship between gravity and weight. Weight is a force based on the effect of gravity on an object's mass. Weight is measured in newtons (N). The gravitational field strength of the Earth is 10 while the moon's is 1.6. Weight in newtons can be calculated by multiplying mass (in kg) by the gravitational field strength (N/kg). Students should research the gravitational field strength of all the planets in the solar system to discover their weight in newtons on each of them. Additionally, students can setup a CoSpaces simulator using the physics engine to alter mass and gravity, noting the effects on objects.

IMPACT ON LEARNING

ClassVR allows pupils to pull on a virtual spacesuit and walk in the footsteps of Armstrong and Aldrin. That ability to experience something out of the ordinary has a powerful effect on learners. The excitement and pull of that experience can create a strong desire to learn more and to take that learning further. The ability to then create a virtual environment in CoSpaces and alter gravity and mass add a further immersive layer. Activities like this, a blend of approaches covering science (physics), computing and maths are held together by the shared experience of pupils who have just 'walked on the moon'.



Print 3D Spinning Tops with AR

DESIGN & TECHNOLOGY Age 10-12



David Mann



Educational Services
Director Avantis Education

Learning Aims:

- To use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose.
- To generate, develop, model and communicate their ideas through discussion, annotated sketches, prototypes and computer-aided design.

CONTEXT

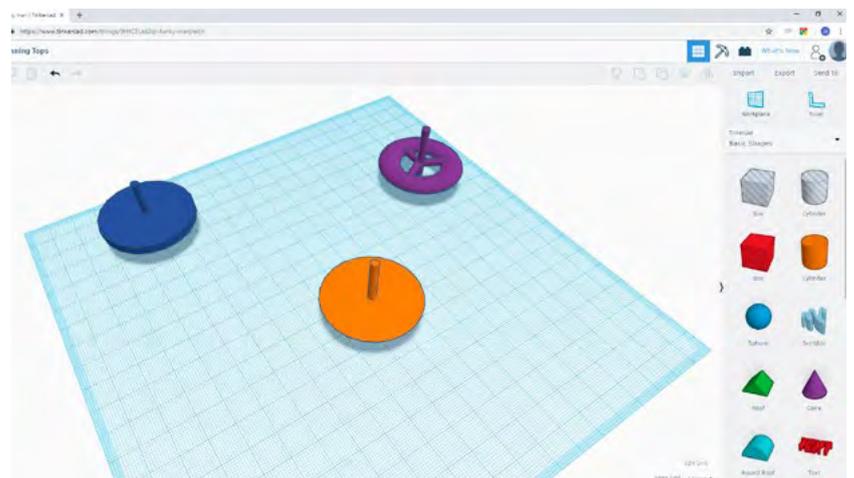
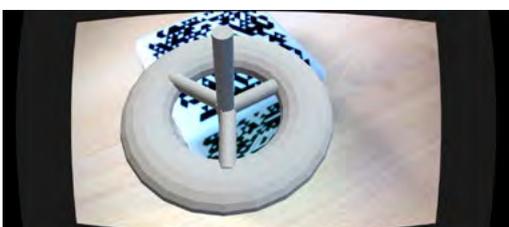
It's crucial that students have had the opportunity to explore some manufactured small spinning tops of various types, so they can begin making predictions about what makes them work effectively. Students also need experience using basic tools in a 3D modelling platform – we used Tinkercad. They will need to know how to: create and modify basic blocks, align blocks, and group them to create a single model.

PRACTICAL SESSION

This teaching sequence takes place over a series of sessions; students need time to research, plan, design, review, make and evaluate their creations. Once students have had time to investigate existing designs and have narrowed down a few key shapes, they can begin modelling in CAD. Make sure they think carefully about the axis around which their top will spin – how will they make sure it stays upright? Check that students are using appropriate 3D shapes as building blocks, then aligning and grouping them accurately. Once they've done this, export their models as STL files and upload them directly to the Shared Cloud library in the ClassVR Portal. Send these to the headsets and give students an opportunity to view them from all angles using the ARcube. Use this as a chance to review and make any edits before the 3D printing phase. Finally, it's time to find out whose top can stay spinning the longest!

IMPACT ON LEARNING

The ability to view and manipulate 3D designs in Augmented Reality before 3D printing adds a tactile dimension to the process of designing and making a real-world object. This is particularly helpful for students who find 3D visualisation difficult, and offers a valuable opportunity to discuss how designs can be optimised and improved. The satisfaction students gain from seeing a project like this through from start to finish is hard to underestimate, and it's a great way to integrate several different types of technology into the curriculum. All too often, incredible assets like 3D printers can lie unused in schools; providing scaffolded teaching sequences that use the technology for a purpose can help to unlock their potential.



Out of this World Writing

ENGLISH Age 9-11



Anna Alford



Penybont Primary School,
Bridgend, UK

Learning Aims:

- To select appropriate grammar and vocabulary, understanding how such choices can change and enhance meaning.
- To describe settings, characters and atmosphere skilfully.

CONTEXT

This session slotted into a teaching sequence for narrative writing, which linked well with our studies in Science (finding out about the Earth and space). Prior to the lesson, students had already used the ClassVR headsets in pairs. They had read a number of texts linked to space exploration, and identified key vocabulary from these texts. They had also been learning about how narrative structure can build suspense.

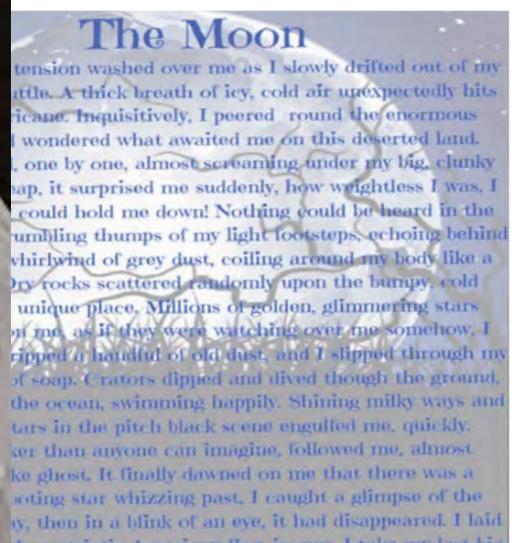
PRACTICAL SESSION

Lunar Rover

Each student's strengths and weaknesses were complemented by working together. One partner wore the headset and described everything they could see on the moon's surface, while the other partner acted as a scribe. This approach is particularly helpful for those students who find writing difficult, as they could practise their verbal skills and really get creative with vocabulary, while their partner listened and noted down key words and ideas. Difficulty in recording ideas can really put some children off writing, creating a huge barrier to learning. The combination of an exciting stimulus, which they instinctively want to talk about great detail, and a partner to write down ideas is extremely powerful and managed to engage even our most reluctant writers.

IMPACT ON LEARNING

The notes made during the partner work were invaluable when it came time for the writing session. Students wrote poetry from the perspective of an astronaut on the moon. Their virtual reality experience had given them all sorts of details about textures and colours; it allowed them to consider what objects or senses they might include and supported their ability to use more ambitious vocabulary in their writing. In combination with visualising the striking image they had experienced earlier and revisiting their peer-created notes, the final outcome on the quality of writing was really impressive.



Space

SCIENCE Age 9-10



Graham
Bowman



Educational Technology
Consultant
Tablet Academy

Learning Aims:

- To gain an understanding of the relationship between Earth, the Moon, the Sun and other planets in the Solar System including their size and properties.
- To gain an understanding of the varying gravitational forces in place and how these relate to the Solar System and Milky Way.

CONTEXT

This lesson is intended as a hook at the beginning of the topic so no prior knowledge is assumed, although most students will have a basic understanding of the solar system and gravity. This lesson would fit in well to a scheme of work which focuses on space exploration, understanding the solar system and/or comparing size, speed and shapes (such as a geometry focus in mathematics).

PRACTICAL SESSION



Space Playlist

The session starts inside a servicing facility at NASA's Kennedy Space Center. Students are asked to look around and think about where they might be, why everyone is wearing special clothing and what the large silver object might be. Next, students watch a 360 video of a rocket launch which gives a great idea of the size of the rocket and the amount of thrust required to leave Earth's gravitational pull. Following the launch, the class then arrives at the International Space Station. Students are asked to think about what difficulties astronauts would face and tasked with finding as many modifications made to support the crew for life in Space. Next, we go out into deep space and look back to see an amazing view of the Earth, the Moon and the Sun in the distance. Here we discuss the relative sizes of the objects and how that mass affects the gravitational pull. At this point, the class watches a truly inspirational and emotional video called One Strange Rock, in which we find out more about what it's like to live on-board the International Space Station travelling 17,000 mph around the Earth. Finally, we explore images of the Solar System and Milky Way to get an idea of how small and insignificant the Earth really is.

IMPACT ON LEARNING

Students were massively engaged by this experience. As well as finding out information from the session, they go away with even more questions than answers! This puts students in a great place for the follow-up lessons exploring the topic in more detail.



Seasonal Change

SCIENCE Age 5–6



Iona
Bullard



Minet Infant School,
London, UK

Learning Aims:

- To describe the features of summer.

CONTEXT

Children had been learning about seasonal change; we focused on the characteristics and features of Autumn, Winter and Spring to provide scaffolding and background about the other seasons, thinking about how they each feel, smell and look.

PRACTICAL SESSION

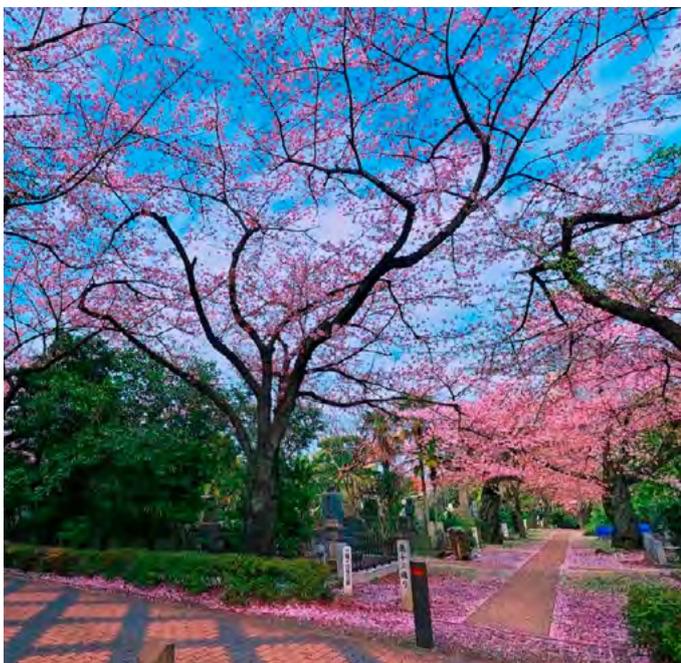


Summer Playlist

In talking partners, children were asked to think of all the words they could think of about Summer; they were challenged to think of as many words as they could. I scribed the children's comments and encouraged a discussion about the season; the children then went to their tables to explore and experience summer images from the seasonal playlist. They were asked to write sentences about what they could see, focusing on their senses and use of vivid, powerful language. We then undertook a word association game for the season of summer and I gave them a challenge to think of more than 15 words, having now experienced the virtual reality. I then scribed their new and improved ideas on the whiteboard.

IMPACT ON LEARNING

The children seemed to really enjoy using the ClassVR headsets. Our school is 98% EAL and the language they gained from using ClassVR was great to see. As many of them have never seen summer like the one in the picture, it enabled a multi-sensory and visualised approach to enriching their learning. Further, it encouraged them to work in a team, by sharing the ClassVR headsets and using dialogue to explain the wonderful sights they were seeing. They also showed responsibility in how they handled the equipment and were eager to do the writing activity afterwards.



Comprehension Skills

ENGLISH Age 9-11



Muriel Thompson



Brecknock Primary School, London, UK

Learning Aims:

- To be able to use inferential thinking to support understanding and comprehension.

CONTEXT

A key focus within our school is to ensure children are given the right tools to become successful readers and are able to fully comprehend high-level texts independently. Inference was a clear domain children struggled with across the school when analysing assessment data.

PRACTICAL SESSION

While strategies such as use of a dictionary, morphology and context can be taught, we needed to stimulate the knowledge already there and build on it. At the start of our 'War and Peace' topic, we worked with a group of children and gave them a poetry comprehension about a topic they knew little of – World War One. We then integrated the World War One trenches experience to provide a visually-immersive and audio-enhanced learning opportunity, so the children had virtually explored, first-hand, the conditions and living arrangements of that era. This really supported the work we went on to do based around the text 'War Horse'. We spent a lesson focused on figurative writing and understanding the deeper meanings of text, asking key questions, such as "Why does the poet choose to look up?" and "How did the poet/character feel?" This led on nicely to a number of VR-based lessons we undertook, which explored: questioning, clarifying, making connections and inferential thinking skills – all of which underpinned our drive to improve reading and comprehension skills.

IMPACT ON LEARNING

Giving children an ownership of discovering word meanings would allow them to be able to use their growing understanding of vocabulary to make accurate and valid inferences. Some of the pupils said, "The VR experience helped me imagine the scene" and "I didn't realise how much could be going on in a trench or battlefield." Having experienced the trenches and understood the conditions, one pupil recalled that the poet chose to look up in one of the poems studied to "get away from the guns and dead bodies and see his family in heaven." As such, the use of ClassVR stimulated talk, which is vital for children to articulate themselves and communicate their thinking.



Comparing Australia

GEOGRAPHY Age 14–15



Bryan
Mortenson



New Braunfels High School,
Texas, USA

Learning Aims:

- To analyze the various terrain features of Australia.
- To compare and contrast coastal and central Australia.
- To explain how and why Australia has such a different landscape.

CONTEXT

Prior to viewing the Australia VR, students labelled a map of Australia and analyzed climographs of various cities in Australia. We wanted to explore and experience Australia in as much detail and depth as possible. The idea behind using ClassVR is to bring a multi-sensory, tangible experience to students' learning.

PRACTICAL SESSION



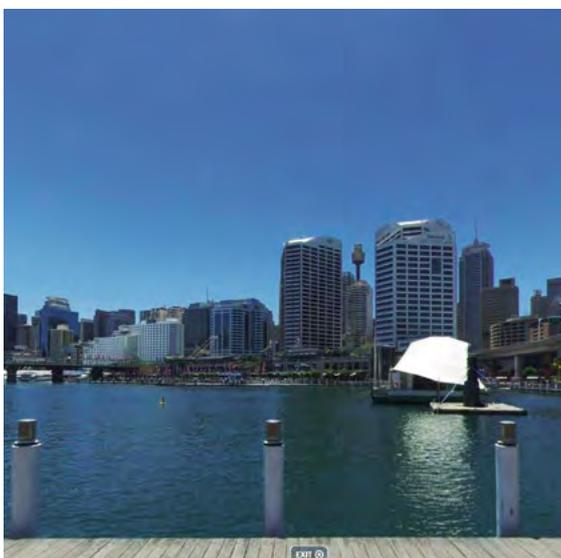
Australia Playlist

The lesson was organized into stations and students rotated through a ten-minute cycle using the ClassVR headsets. The other stations included map reading, colonial history of Australia, indigenous people, climate zones, and population distribution. The ClassVR station directly supplemented the other learning the students were doing, creating a holistic approach to the lesson.

During the use of the headsets, I asked various questions to encourage the students to analyze the landscapes and locations they were viewing. The students, in turn, asked their own questions about Australia, its geographical and human history, as well as sharing their thoughts on modern day Australia.

IMPACT ON LEARNING

In the days after the ClassVR experience, the students referenced to the images as we applied other geographic concepts to Australia. For example, when students discussed the population distribution of Australia they were able to give specific examples from the ClassVR session to justify their response.



Under the Sea

CREATIVE WRITING Age 9-11



Arlene Beattie



Daviot Primary School,
Inverness, UK

Learning Aims:

- Use descriptive language to develop writing skills.
- Use the five senses to describe a setting.
- Spell common words accurately.

CONTEXT

The children are developing their understanding of what is happening to our oceans; many children have not experienced or ever been in the ocean to observe what it should look like. Therefore, as a pre-session activity, we undertook a small group discussion about oceans and what they look like. The key questions to discuss were: Have you ever been in an ocean before? Where was it? What was it like when you looked down at the bottom of the sea? What kind of things could you see – describe them? What would you expect to see?.

PRACTICAL SESSION



Underwater Playlist

Once we had discussed and reviewed the key questions, we undertook a group task to build a bank of descriptive phrases associated with what the ocean may look like, using 2D images to help generate ideas. After completing their mind map of descriptive phrases, the children experienced the ClassVR headsets in pairs. We focused on the Underwater playlist, taking a deeper look at the Fish and Coral, Underwater Caribbean and Clownfish New Caledonia tracks. The pupils with the headsets on used their pre-knowledge of descriptive phrases to describe to their partner what they were seeing. The partner's role was to write these down on their mind map. After a period of time, the children swapped and continued until all the images and videos have been completed. By the end of the session, all the pupils built up a bank of descriptive phrases that they could then use in their own writing when creating a description of the ocean.

IMPACT ON LEARNING

The children have a far greater understanding of what the ocean looks like. They can experience first hand how the fish and plant life move in the water and they became familiar with the colours and noises that can be heard in a real-life ocean. Therefore, they were able to add all of this content into their written piece. The children were able to use their senses to write an in-depth setting description of an ocean. The follow-on lessons will look at: What is happening to our oceans with the impact of plastics? What impact will this have on the plant and animal life?



Battle of Britain

HISTORY Age 15–18



Jeffrey Maronde



THE BATTLE OF BRITAIN



Stanberry R-II, Stanberry, Missouri, USA

Learning Aims:

- To trace the significant events and developments of WWII.
- To describe critical developments and turning points in WWII.

CONTEXT

This session allows students who have started the WWII unit to analyze one of the first major battles of WWII. The goal was for students to be able to see some of the vehicles used during the battle and connect that to the outcome of the battle. Our students were able to compare and contrast the vehicles from the different sides of WWII and also compare it back to some of their knowledge of WWI.

PRACTICAL SESSION

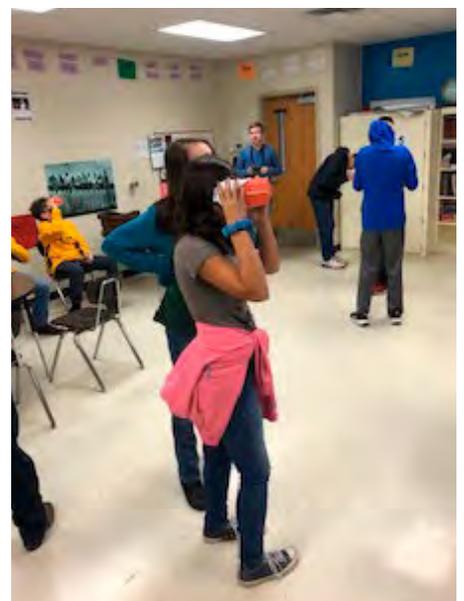


Conflicts Playlist

Taking turns, the students described what they saw, and we had a class discussion on how the vehicles shown differed from each other and how their features helped these vehicles in battle. Using the zoom and rotating tools on the headset allowed the children to fully explore the aircraft and the tank to see how they might have operated in battle. We also discussed how these vehicles differed from their counterparts from WWI. This was used to supplement along with notes about the Battle of Britain and students were able to hypothesize how the Spitfire allowed the Royal Air Force to ultimately win the battle and stop the invasion of Britain by the Nazis.

IMPACT ON LEARNING

Having the ability to see the vehicles of war with the headsets, they had a better understanding of what these looked like and how they were used in war. This provoked discussion of why they were designed that way and how they changed warfare during WWII. This provided a first-hand learning approach for the students.



The Plight of Refugees

SOCIAL STUDIES Age 10–11



Christine Bitetti



Chris Fontenova



Yonkers Public Library,
Yonkers, New York, USA

Learning Aims:

- To understand what a refugee is.
- To understand what asylum is.
- To understand what reasons people may have to flee where they live.

CONTEXT

The students were learning about conflict in different countries and watched the documentary "I'm Not Leaving". The following week, Carl Wilkens came to the school to visit and with the students discussed the documentary and the themes which featured in the programme. As a follow up, Mr Fontenova did a Friday Focus VR session on conflict and refugees.

PRACTICAL SESSION



Refugees Playlist



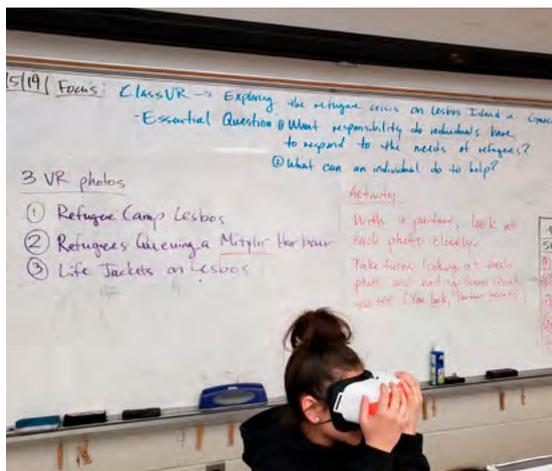
Escaping Conflict lesson plan

The children looked at several photos and watched a video based around the Escaping Conflict ClassVR lesson plan. The students were asked: What did you see? Did it look how you expected it to? What were the first thoughts that popped into your head when you imagined being in their situation? Were you surprised by what you saw? Why is this?

The discussion included why people are angry and scared; why the conditions are so crowded and dirty; and, whether it is better than where they were before. We then asked the students to consider balancing up whether it was worth it to leave the disaster zone and seek refuge elsewhere or whether the plight would be more dangerous than remaining. This prompted some excellent discussion and encouraged the students to reflect objectively on other people's living circumstances.

IMPACT ON LEARNING

The children saw first hand some of the things that happen during conflict and understood the terms 'refugee' and 'asylum seeker'. They were empathic to the children who were fleeing their homes, families, friends, schools, country, etc. They were also asked to list five things they would take with them if they suddenly had to flee their homes. It also started a conversation on human rights and if these people's rights are being met: waiting hours in line for a little bit of food, not being able to get clean water to drink or wash up. It was a very powerful learning experience and these students, at just 10 years old, were able to think very critically and objectively.



Sense the Scene

SCIENCE Age 8-10



Megan Barrett



Trevilians Elementary
School, Louisa, Virginia,
USA

Learning Aims:

- To identify sensory words that identify sights, smells, sounds and tastes.
- To describe how sensory words contribute to text.
- To create visual/oral representations of the text identifying specific descriptions.

CONTEXT

Using virtual reality, students were able to explore and describe locations that most students will never get the opportunity to see in person. This in-class vacation helped students to easily describe a setting using sensory words. Students learned the importance of describing a setting in their writing, so that readers could better visualize their story.

PRACTICAL SESSION

On the day prior to this lesson, students explored sensory bins and we created an anchor chart of sensory words from their experience, words they could use in the activity. I started off the VR lesson by reviewing what sensory words are, referring back to the anchor chart and we discussed why these words were important. Once students were separated into partners, the partner who would start wearing the headset first (partner 1) randomly selected a VR location card from a pile. They were not to share the location with their partner, since the partner would later guess the location from their description. I gave the first teammate three minutes to put the headset on and describe the location using sensory words. The partner that was not in the virtual reality (partner 2), wrote down those descriptions on a graphic organizer. The graphic organizer also included questions that would help to prompt more ideas for senses that were difficult to describe. When the three minutes was up, partner 2 had three more minutes to draw a picture of the location using the description from partner 1. Before switching jobs, partner 2 shared their picture with partner 1 and guessed the location. Then, partner 2 explored the VR location, while partner 1 added new notes to the graphic organizer. When partner 2's time was up, the students reflected on the experience and how they did. They looked at the picture that partner 2 drew and discussed what descriptions could have been added or changed to improve the representation of the location, if they were not correct. Teams also shared their experience with the rest of the class. As an extension, students worked with their partner to create a narrative story with their setting and they had to include sensory words from their graphic organizer.

IMPACT ON LEARNING

The students were engaged and highly interested in exploring and learning. This also helped my students to be more supportive of each other because they were working toward a common goal. Students also worked on their communication skills as they collaborated with their partner. The virtual reality experience provided an authentic opportunity to describe a setting using new vocabulary words. Since students were "wowed" by the scenery, they were eager to share their description of the setting and the words came easily. In addition, there was a much higher level of participation and focus during this lesson than what I had seen on previous lessons.



Elements & Compounds

CHEMISTRY Age 16-17



Matthew Shively



State Correctional Institution, Muncy, Pennsylvania, USA

Learning Aims:

- To identify physical and chemical properties and changes.
- To compare substances and mixtures.
- To compare elements and compounds.

CONTEXT

This was designed to be an introduction to the periodic table of elements, scientific method and significant figures. The idea was to make chemistry interesting and more concrete as it tends to be primarily an abstract subject. The students were encouraged to learn the structure and structural changes of atoms.

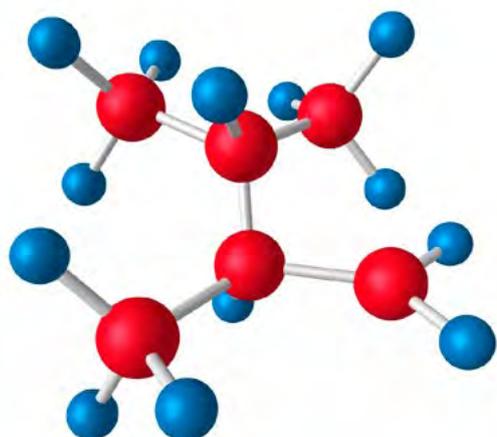
PRACTICAL SESSION

Chemistry 3D Playlist

During the session, I gave the students the opportunity to view elements and compounds with a 360-degree view, right at their desk. Using the chemistry 3D objects for several elements and compounds, they were able to see the structural changes and sometimes slight or drastic differences. After the experience, the students located the atomic number, element symbol and atomic mass for the elements they viewed in the ClassVR.

IMPACT ON LEARNING

The VR experience made chemistry more interesting and gave the students a concrete example on which to develop their skills. It allowed students to explore 3D elements and compounds that typically would only be seen in a 2D textbook image. It is a great starting point for chemistry as the concepts tend to get more difficult. Having that visual foundation gave my students the opportunity to feel more comfortable with chemistry.



“THE ONLY SOURCE
OF KNOWLEDGE IS
EXPERIENCE”

Albert Einstein

To learn more about how VR & AR can increase engagement and improve outcomes for your students, get in touch with us today to arrange a free consultation with our education specialists.