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**2020-2021**

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Classroom of the  
Future with  
Augmented and  
Virtual Reality

# *Classroom of the Future with AR/VR (Augmented Reality/Virtual Reality)*



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# TABLE OF CONTENTS

GOALS AND OBJECTIVES .....	3
COMMON CORE SCIENCE STANDARDS .....	4
INTRODUCTION .....	6
COURSE OUTLINE AND OVERVIEW .....	7
SAMPLE LESSON PLAN .....	12
SAMPLE STUDENT WORK .....	13
RESOURCE LIST AND INTERNET SITES .....	15
REFERENCES .....	18



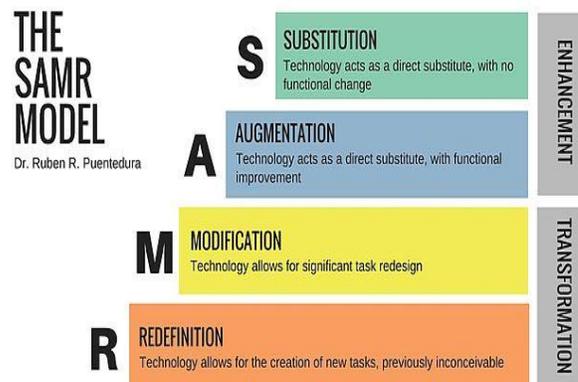
Image Credit: Merge VR

## Goals and Objectives

The source of my idea came from the need to engage, motivate, and help my students visualize Science concepts in the classroom and during Distance Learning. My idea was originally funded as an Innovator Grant sponsored the P.L. Dodge Foundation. As an educator I'm always looking for new and innovative ways to engage my students and get them excited about learning. And as a parent I know how frustrating it is to get kids interested in learning something new which they believe is not necessary for them in life. Especially if it is not going to help them in what they already do with most of their free time in Fortnite, Roblox, or Minecraft.

Teachers face a constant struggle by trying to engage and maintain student engagement whether in the classroom or online. The struggle is no different even when schools had to shut their doors and begin distance learning from home due to COVID-19. So now more than ever it makes sense to cross that comfort zone where teachers traditionally teach from and enter the "Classroom of the Future with Augmented and Virtual Reality."

Educators today have had to step out of the classroom (and our comfort zone) to teach remotely through video conferencing tools means such as Zoom. But if all we do is just sit from our homes to explain a lesson without student engagement, we have totally missed a wonderful opportunity to utilize the SAMR Model and infuse our lessons with amazing technological tools of learning and engagement.



## Common Core Science Standards

According to the Florida Department of Education, the NGSSS (Next Generation Sunshine State Standards) for science are organized by grade level for grades K–8. Although 18 Big Ideas are present throughout all grade levels and build in rigor and depth as students advance, not all grades have benchmarks for each Big Idea. The benchmarks for grades K–2 serve as a foundation for grades 3–5 benchmarks. For that reason, science teachers in K–2 must ensure a good solid foundation so that students can succeed later on in school and especially when it is time for them to take the Science FSA Assessment in 5th grade.

These are some of those foundational standards in the elementary and middle school grades which can be utilized as an added resource when using Merge Cube, Quiver, JigSpace, and WWF Free Rivers downloadable applications:

**SC.2.E.6.1** Recognize that Earth is made up of rocks. Rocks come in many sizes and shapes.

**SC.2.E.7.2** Investigate by observing and measuring, that the Sun's energy directly and indirectly warms the water, land, and air.

**SC.2.L.17.2** Recognize and explain that living things are found all over Earth, but each is only able to live in habitats that meet its basic needs.

**SC.2.L.14.1** Distinguish human body parts (brain, heart, lungs, stomach, muscles, and skeleton) and their basic functions.

**HE.2.C.1.6** Recognize the locations and functions of major human organs.

**SC.3.E.5.3** Recognize that the Sun appears large and bright because it is the closest star to Earth.

## Middle School Standards:

**SC.6.E.6.2** Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.

**SC.7.E.6.2** Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building).

**SC.7.E.6.5** Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.

**SC.8.E.5.8** Compare various historical models of the Solar System, including geocentric and heliocentric.



Image Credit: Merge VR

## Introduction

It may be hard to believe but by 2025, two billion of the world's population is going to be made up by the youngest generation: Generation Alpha. Generation Alpha are children born between 2010 and 2025 (Vargason, 2017). This generation of students are considered to be the most technologically infused generation to date. They have no problem using technology, smartphones, tablets, and computers. These students have never known a world without Internet, or video games. Therefore, today's educator must captivate student's attention with game-based learning, virtual reality and augmented reality devices in order to engage the Generation Alpha students and get them excited to learn.

Having the ability to pivot from classroom instruction to remote learning should not hamper student learning when it comes to content areas in regards to technology. Being an educator in this technological era and during the COVID-19 pandemic, means staying up to date with engaging programs that will help students not only understand complex and abstract concepts but allow them to see how those concepts are useful in preparing them for their possible future careers which may not even exist at the present moment. According to Steel (2020), future jobs in 2050 is estimated to suggest that "65% of primary school-aged kids will end up in a yet-to-be-created careers. We're guessing packed with next-gen STEM gigs in cutting-edge fields like Augmented Reality (AR), data analytics, and Artificial Intelligence (AI)-based service roles." Infusing the classroom with modern technology whether its brick and mortar or virtual, is essential in addressing today's student needs (Wichlinski, 2017). Wichlinski (2017) goes on to say that "by integrating these methods into our current system (of instruction), we can better prepare students for the real world." These words are even more evident and real given our current pivot to remotely learning as a new norm.

## Course Outline and Overview

Being a parent of a child that needs continued motivation to succeed in school has given me a different perspective and approach to engage students within my own classroom. Every student wants to succeed but getting them motivated in education is key to achieving that academic success. Ask the majority of students to study for a science test, and I'm sure their motivation to pick up a book or an outline defining scientific concepts and vocabulary is less than positively taken into consideration. Yet, ask a student to take out their cell phones, or tablet and use a hand-held cube to learn about the human body with a 3D holographic image, and their curiosity, engagement, and motivation has suddenly reached new heights. This type of learning is the future of education. And I recently discovered, can easily be used during distance learning through video conferencing.

Using digital technology, virtual realities can create experiences for students which would otherwise be very difficult or even impossible for them. Today's student is very tech savvy and it's no wonder they are the Generation Alpha, so why not use that technologically infused child and take advantage of their advantage in using technology which will capture their interest in learning. As an educator I not only want my students to succeed academically, but also to positively impact their future success, college plans and future careers. I have no doubt that the future of education will be centered around the use of technology.

According to April Chamberlain (2014) the District Technology Integration Specialist at Trussville City Schools, "Education is evolving due to the impact of the Internet. We cannot teach our students in the same manner in which we were taught. Change is necessary to engage students not in the curriculum we are responsible for teaching, but in school. Period." Chamberlain's (2014) statement is prophetic and made very real as our nation tries to educate our students during this COVID-19 pandemic. If we are to truly prepare our students for their future, we must grasp the idea that technology is and will surround every aspect of our lives whether educators teach in a brick and mortar setting or virtually.

Given what we know from this new generation of student learners, as educators we can't teach them the way we were taught; no more "old school." We must find new means of engagement with our Generation Alpha students but at the same time, as teachers, our means of funding any type of new devices must be cost effective. We must be creative, tech savvy, and resourceful to provide our students with that high level of digital technology engagement. This is why I began using the Augmented and Virtual Reality resources to enhance student engagement and learning. Here is a brief overview of the programs I used to engage my students:



**JigSpace:** a platform to explore and share interactive 3D knowledge for everything. In other words, JigSpace allows you to see a step-by-step interactive 3D breakdown of a complex idea, product, and phenomenon, in order to understand how they happen, operate or work. JigSpace can be used to introduce and explain different concepts, such as tectonic plates, an underwater coral reef, how a battery works, the scale of the solar system, and the structure of the human brain. My students loved seeing the objects in front of them and within their proximity giving them the impression of being right in front of the object being viewed. Even during our Distance Learning due to COVID-19, I had the students explore the underwater coral reef using JigSpace. This sense of going outside (digitally) during our quarantine made them curious about learning even more of the other free JigSpace topics. Currently, it only works on recent Apple devices such as iPad 2018 and newer, iPad pro, iPad mini (2019, 5th gen), iPad Air (2019, 3rd gen), and iPhone 6 or newer models. And even more impressive is that the app is free!



Quiver is another AR/VR app that combines physical coloring from “back in the day” with state-of-the-art augmented reality technology. With the Quiver app, my students brought their unique coloring creations to life in an extraordinary 3D augmented reality. I used Quiver to teach about the Earth and our continents. Characters literally leap off the page, to engage students while providing useful educational information on the selected coloring page, such as the continents, solar system, or the Pukeko, a swamp hen from New Zealand.



WWF Free Rivers augmented reality app puts an entire landscape in your hands. Students immerse themselves in its incredible virtual world, where they meet the people and wildlife that live there. Through this in-depth, interactive storytelling experience, students learn how wildlife, people and entire landscapes depend on healthy, flowing rivers. I used this application during Earth Day which was during the Distance Learning time. The students got to see what happens to the environment when we don't take care of our waterways. Students were able to dam a river to see what happens, and then try a sustainable energy mix that keeps the river connected but still satisfies growing energy demands.



My students using the Merge Cube in the classroom and virtually.



The Merge Cube is a black and silver physical cube that has inlaid designs that interact with various Merge Cube apps to transform the cube into a digital canvas, whether that entails the solar system, the body, or a pocket aquarium. The Cube works by using the camera function in the apps to detect the distinct pattern of the cube's sides to allow the coding to interact with it, in the same functional manner as a QR code on a product. The cube works in tandem with an app, and if you slide the phone in the Merge's version of a Google Cardboard headset, you will be fully immersed in the scene.

During Distance Learning I tried several means of using the Merge Cube with my students. At first, I just used my phone and the Merge Cube to show them the different parts of the body and their functions with Mr. Body during my Zoom meeting with them. Students were so mesmerized that they wanted to experience it for themselves. I sent every student a printable Merge Cube PDF document, but many didn't have a printer. I then decided that if their parents were willing to come to either the school or my house, I would print it for them on Cardstock paper and give it to them. Still some were not able to get one. So, I had those students download the Merge Cube App and open the app during our Zoom session where I shared my screen and they scanned the image to get the 3D, virtual reality image of the human body. By the last couple of weeks of Distance Learning all my 34 students were able to use the Merge Cube and the free Merge Explorer application to increase their level of engagement, learning, and curiosity about the human body.

The Merge Cube is only \$20 yet its capabilities and applications are immeasurable in terms of student engagement and cost effectiveness. You will

also need a smartphone or tablet and download the free applications called MERGE Explorer from your App Store. The Merge Cube acts like a QR code giving the apps the ability to appear holographic and in 3D. If you don't feel safe handing over your smartphone to your students to use with the Merge Cube, you can buy the Merge AR/VR Headset - Augmented and Virtual Reality Goggles (\$30) and securely put your phone in the protected goggles.

This project can be adapted from K-12th grade, yet in my opinion given the apps I utilized it would be better suited for elementary and middle school students serving as a sound foundation for high school. I have been using this project several months and witnessed how it has helped not only my struggling students succeed academically, but my ESOL (English to Speakers of Other Languages) students, who lack the vocabulary and English language. Since some of my students are ESOL Level 1, I found that when they brought their own device (formatted in their language) to use with the Merge Cube, all the text for the desired information was in their home language. Students got to see what each piece of information said in their language, while learning the vocabulary terms and meaning in English. This was an even greater feature I didn't even know was available until I started using it with my ESOL students.



Student viewing text information in his own language

## Sample Science Lesson

### The Human Body Parts



### Florida Science Standard

**SC.2.L.14.1** Distinguish human body parts (brain, heart, lungs, stomach, muscles, and skeleton) and their basic functions.

**Learning Objective:** Understand how structures and systems of organisms in the human body perform functions necessary for life. In this lesson students will gain the skills to identify and explain the characteristics and functions of observable body parts.

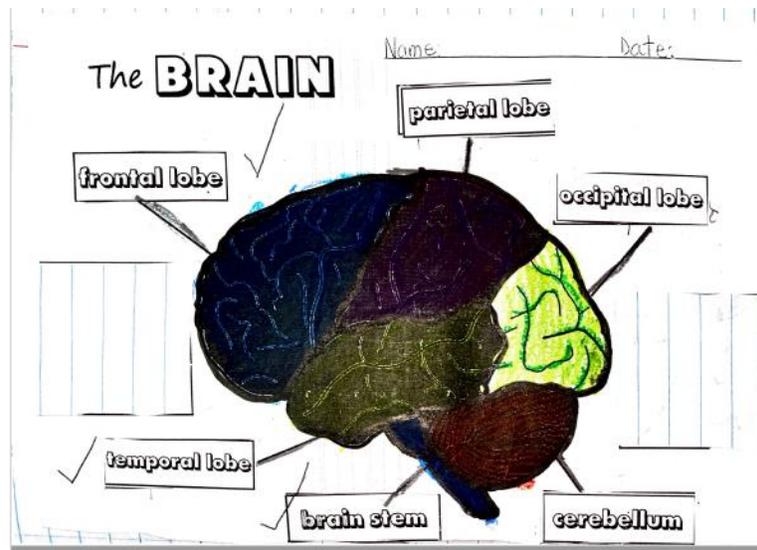
Activities:

1. Download the printable Merge Cube from:  
<https://mergeedu.com/download/file.php?f=paper-merge-cube.pdf>
2. Print the printable Merge Cube onto white cardstock paper.
3. Follow the instructions on the downloaded file. I used double-sided tape to tape the inside of the cube.

4. Have students illustrate and write in their Science Journals the human body parts (brain, heart, lungs, and stomach) and their basic functions using the Merge Cube.

5. Extend the lesson by going in depth into the different lobes of the brain and their specific functions in their Science Journals.

### Sample Student Work



Worksheet from: <https://thecraftyclassroom.com/crafts/anatomy-crafts-for-kids/brain-crafts-activities/>

**BRAIN**

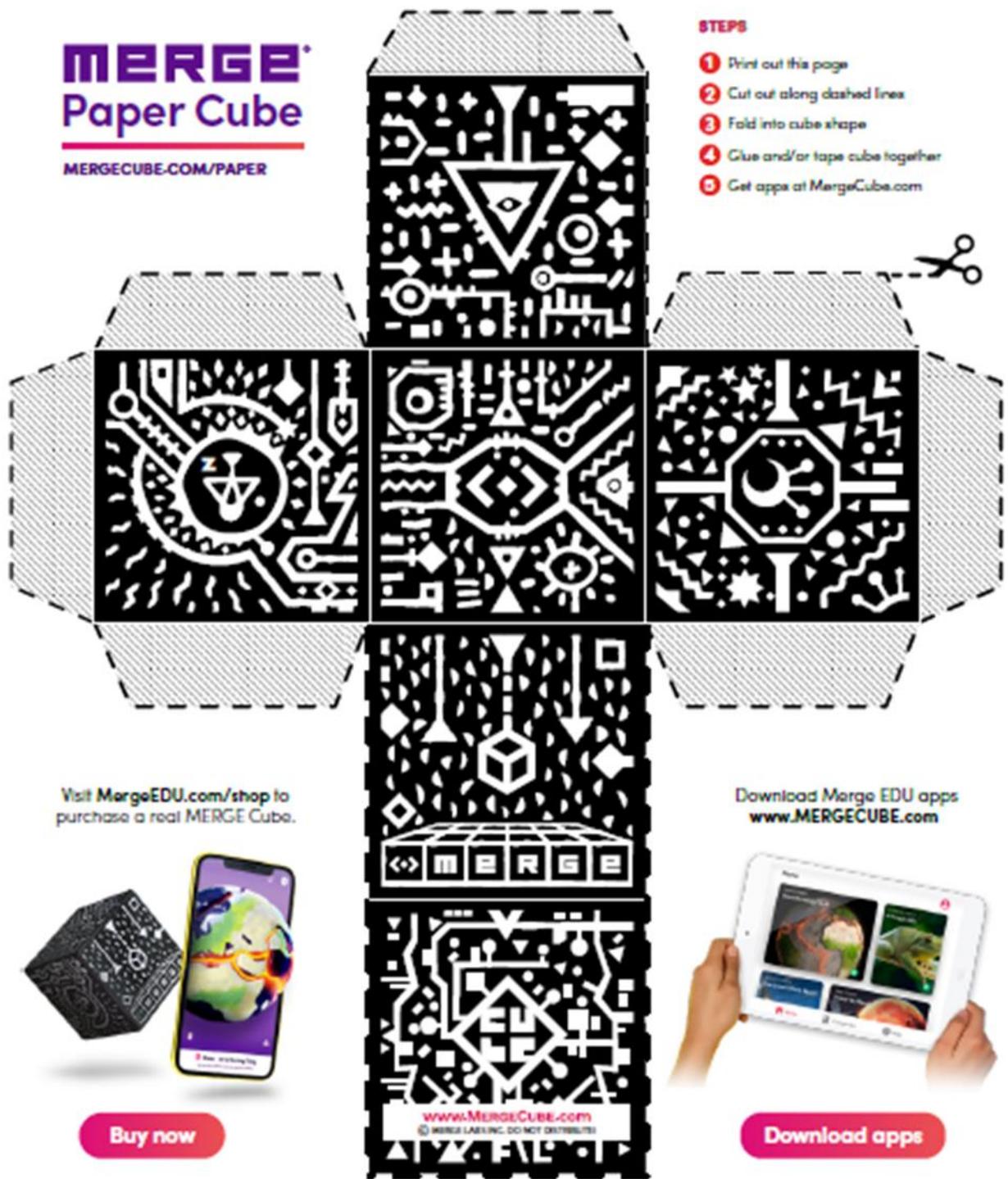
<p><b>1. FRONTAL LOBE</b></p> <p>We use this lobe for speaking, thinking, planning, and making decisions. It's for deciding what to next and planning your next move in chess. It all thanks to your frontal lobe.</p>	<p><b>2. TEMPORAL LOBE</b></p> <p>The temporal lobe is in charge of processing the huge range of sounds, pitches and words we hear in the world around us, and turns the sounds into something meaningful we can understand.</p>
<p><b>3. OCCIPITAL LOBE</b></p> <p>The occipital lobe is our brain's visual processing center. It not only gives us accurate information about what our eyes are seeing, but it also plays an important role in reading, too!</p>	<p><b>4. PARIETAL LOBE</b></p> <p>This part of the brain processes sensory information in seconds, like touch, taste, and even temperature. If we touch something too hot or cold, our parietal lobe lets us know!</p>

# MERGE<sup>®</sup> Paper Cube

MERSECUBE.COM/PAPER

## STEPS

- 1 Print out this page
- 2 Cut out along dashed lines
- 3 Fold into cube shape
- 4 Glue and/or tape cube together
- 5 Get apps at MergeCubes.com



Visit [MergeEDU.com/shop](http://MergeEDU.com/shop) to purchase a real MERGE Cube.



Buy now

Download Merge EDU apps  
[www.MERSECUBE.com](http://www.MERSECUBE.com)



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## Internet Resources List:

The resources needed to use the Merge Cube are easily accessible through Apple App Store or Microsoft Store depending on your device and operating system. Here is a list from [www.MINIVERSE.io](http://www.MINIVERSE.io) giving a brief description of the app, QR code, available languages, operating system, and cost.

# MERGE CUBE APP LIST



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		<p><b>CUBE PAINTAR</b> <span style="border: 1px solid green; padding: 2px;">FREE</span>  </p> <p>English</p> <p>Choose your favorite 3D animal with MERGE Cube, rotate your animal in the palm of your hand to view it from every angle, then paint it whatever colors you choose!</p>			<p><b>DEFUSED!</b> <span style="border: 1px solid green; padding: 2px;">FREE</span>  </p> <p>Deutsch, English, Español, Français, 中文</p> <p>Race against the clock and defuse a 3D bomb! Twist and turn the cube to find the correct panel as you follow the instructions to deactivate the bomb for each level.</p>
		<p><b>DIGI</b> <span style="border: 1px solid green; padding: 2px;">FREE</span>  </p> <p>Deutsch, English, Español, Français, 中文</p> <p>Mine and build to create 3D worlds you can hold in the palm of your hand! Choose from unlimited resources like stone, sand, grass, brick, and lava to make anything you can imagine.</p>			<p><b>GALACTIC EXPLORER</b> <span style="border: 1px solid green; padding: 2px;">FREE</span>  </p> <p>Deutsch, English, Español, Français, 中文</p> <p>Hold the solar system in the palm of your hand with Galactic Explorer! Watch as the planets revolve around the Sun in their orbits, explore the texture and color of each planet's surface, and discover interesting facts as you navigate through space.</p>
		<p><b>HOLOGLOBE</b> <span style="border: 1px solid green; padding: 2px;">FREE</span>  </p> <p>English</p> <p>HoloGLOBE brings NOAA's Science on the Sphere (SOS) programs to MERGE Cube, using satellite imagery and data simulations for stunning views of Earth and its many systems.</p>			<p><b>MR. BODY</b> <span style="border: 1px solid green; padding: 2px;">FREE</span>  </p> <p>Deutsch, English, Español, Français, 中文</p> <p>Get ready for a hands-on, holographic anatomy lesson! Select each of Mr. Body's parts to get a close-up view of each vital organ and its function like the heart, brain, lungs, and more.</p>
		<p><b>MUSEUM VIEWER</b> <span style="border: 1px solid green; padding: 2px;">FREE</span>  </p> <p>English</p> <p>3D Museum viewer lets you place each of the life-size artifacts into the real world, with the ability to physically walk around each statue in full 360°.</p>			<p><b>MYARQUARIUM</b> <span style="border: 1px solid green; padding: 2px;">FREE</span> </p> <p>English</p> <p>myARquarium uses the MERGE Cube to give you a palm sized aquarium you can hold in your hand! Choose from over 55 different exotic fish species like the lionfish, mandarin fish, or moorish idol.</p>
		<p><b>MOMENT</b> <span style="border: 1px solid green; padding: 2px;">FREE</span>  </p> <p>English</p> <p>Moment helps children with mental health needs to identify feelings and emotions with professional mental health support providers, teachers, and parents.</p>			<p><b>OBJECT VIEWER</b> <span style="border: 1px solid green; padding: 2px;">FREE</span>  </p> <p>English</p> <p>Upload, view, and share 3D objects on MERGE Cube! Whether it's a sculpture of Michelangelo's David or an original work of 3D art that you created, MERGE makes it easy turn your models into 3D objects!</p>
		<p><b>PARTY GAMES</b> <span style="border: 1px solid green; padding: 2px;">FREE</span>  </p> <p>Deutsch, English, Español, Français, 中文</p> <p>Use the MERGE Cube and play along with your friends! Spin, rotate and tap to win games like Crystal Crush, Starfighter, Tap-N-Toss and more. Use one cube or multiple cubes to compete with your friends.</p>			<p><b>SNAKE ATTACK</b> <span style="border: 1px solid green; padding: 2px;">FREE</span>  </p> <p>Deutsch, English, Español, Français, 中文</p> <p>Maneuver your snake around the MERGE Cube in this retro, holographic snake game! Maneuver your snake around all six sides of the Merge Cube to find food and watch it grow longer with each bite!</p>

**THINGS** FREE  

Deutsch, English, Español, Français, 中文

Experience a fresh collection of holographic mini-games with Things for MERGE Cube! Navigate treacherous valleys as you battle alien forces and hold a campfire in the palm of your hand!

**TILT BALL** FREE  

Deutsch, English, Español, Français, 中文

It's a race against the clock! Guide the boulder through a medieval obstacle course before time runs out. Don't let your ball fall in the water or run off course as you roll your way to victory!

**57° NORTH** USD \$2.99  

English

Two cousins are shipwrecked on a remote island in Alaska, and it's up to you to help them survive, escape, and maybe even discover why there are so many security cameras out in the middle of nowhere.

**ANATOMYAR+** USD \$0.99 

English

Hold the brain, heart, and lungs in the palm of your hands and view them in striking detail using the MERGE Cube!

**AR KITTEN** USD \$4.99  

English

Chose your adorable virtual kitten in this app for the MERGE Cube. Name, feed, and play with your kitten to earn coins and unlock custom outfits so that you can have the cutest kitten around. Bring your virtual pet to life.

**ASK KRANKY** USD \$1.99  

English

KNOW the Future! DARE to tell the Truth or face Danger! DISCOVER how your days are numbered! SEEK your Fortune! SOLVE the mysteries of Love! ALL things are possible if you possess the ancient-modern marvel, Kranky!

**BLOCKAR** USD \$2.99  

Deutsch, English, Español, Français, 中文

Build, solve and win! Use your MERGE Cube to rotate, move and align three or more cubes of the same shape and color. Collect special powers, solve increasingly challenging levels and outwit a diabolical robot!

**CELLULAR** USD \$2.99  

English

Prepare for a new twist on educational cell visualization! Use your Merge Cube to spin, rotate, and view a variety of different cells. Explore the microscopic world like never before.

**CUBE CONQUEST** USD \$1.99  

Deutsch, English, Español, Français, 中文

Alien bugs are invading the planet, and your mission is to stop them before they eat the planet's core! Set up defenses on all sides to defeat them at every turn. Balance strategy and lead your way to victory!

**CYBER CUBE** USD \$0.99  

English

The glitch is coming, and you're the only one who can stop it! Hack into the cyber zone using your Cyber Cube. Match patterns on the cube with the sequence presented on your HUD.

**DINO DIGGER** USD \$1.99  

English

Dig for dinosaurs in this educational game for MERGE Cube! Go back in time to when dinosaurs roamed the land with legendary dinosaur hunter and paleontologist, Jack Homer.

**ELEMENTAL ORDER** USD \$1.99  

English

Can you unlock the Elemental Order? Challenge and be challenged with brilliant, holographic, shapes and colors. Repeat the pattern to test your skills against the MERGE Cube. Unlock the pattern and victory is yours!

**HANGRY HERB** USD \$0.99  

English

Hangry Herb is an AR (Augmented Reality) pet experience for the MERGE Cube. This particular pet plant is pretty persnickety. He doesn't rely on you to live or grow, because you're not really that important to Herb.

**INVASION** USD \$1.99  

English

Overlord Ut has chosen YOU to lead a mission to a distant planet in a desperate attempt to borrow their mighty items. Grab as many as you can and hurry back! There is no time to waste.

**MUNCH** USD \$4.99 

English

Move Munch, the lovable fish, around with your MERGE Cube to eat as many smaller fish as you can find, but make sure not to get eaten by other, bigger creatures.

**NEXUS BOX** USD \$8.99  

English

The Nexus Box is a multiplayer puzzle game where two or more players must work together to unlock the secrets of the mysterious, ancient cube.

		<p><b>RUBIK'S CUBE: AUGMENTED</b> USD <span style="border: 1px solid green; padding: 2px;">\$1.99</span>  </p> <hr/> <p> Deutsch, English, Español, Français, 中文</p> <hr/> <p>Challenge yourself to solve the classic puzzle game with a futuristic twist! Rotate the MERGE Cube in your hand while you turn and rotate the rows and columns of colored squares to put them all back in order.</p>			<p><b>SHAPES 3D GEOMETRY DRAWING</b> USD <span style="border: 1px solid green; padding: 2px;">\$4.99</span> </p> <hr/> <p> English</p> <hr/> <p>Explore and understand 3D shapes in a whole new way with your MERGE Cube! Draw and rotate line-segments, shapes, and cross sections while discovering the inner workings of 3D Geometry.</p>
		<p><b>SUPER SUGAR CRASH</b> USD <span style="border: 1px solid green; padding: 2px;">\$1.99</span>  </p> <hr/> <p> English</p> <hr/> <p>Beat the clock and collect as many sweet treats as you can in this arcade style game for MERGE Cube! Your cube becomes a cloud, and you move to catch falling the candy and bounce the unicorns.</p>			<p><b>TRICKY TEMPLE</b> USD <span style="border: 1px solid green; padding: 2px;">\$2.49</span>  </p> <hr/> <p> English</p> <hr/> <p>Professor Ignatius Crumble and The Evil Adventurers Society have broken into your temple! Build totem towers to protect your precious relics in this tower defense game for MERGE Cube.</p>

Here are more useful sites where you can obtain more information on how to utilize the Merge Cube in your classroom:

Teachers Pay Teachers TpT <https://www.teacherspayteachers.com/>

<https://mergevr.com/cube>

<https://mergevr.com/edu-resources/activity-plans>

<https://drive.google.com/file/d/1y6a3NzcnBoOSky1zrsnHZP-cuwIBodAY/view>

<http://www.janusgroup.us/merge/>

<https://www.virtualiteach.com/single-post/2019/01/29/Top-5-Apps-for-the-Merge-Cube>

<https://thecraftyclassroom.com/crafts/anatomy-crafts-for-kids/brain-crafts-activities/>

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