THE EDUCATION FUND 40 YEARS

FOR EXCELLENCE IN MIAMI-DADE PUBLIC SCHOOLS

2024
2025

Ideas with IMPACT

Technology

Transforming Learning with AR and AI

Disseminator: Zeny Ulloa

zulloa@dadeschools.net
Instructional Technology
Mail Code: 9629

For information concerning Ideas with IMPACT opportunities including Adapter and Disseminator grants, please contact:

Audrey Onyeike, Program Director
Ideas with IMPACT
The Education Fund
305-558-4544, Ext. 113
Email: audrey@educationfund.org
www.educationfund.org

TABLE OF CONTENTS

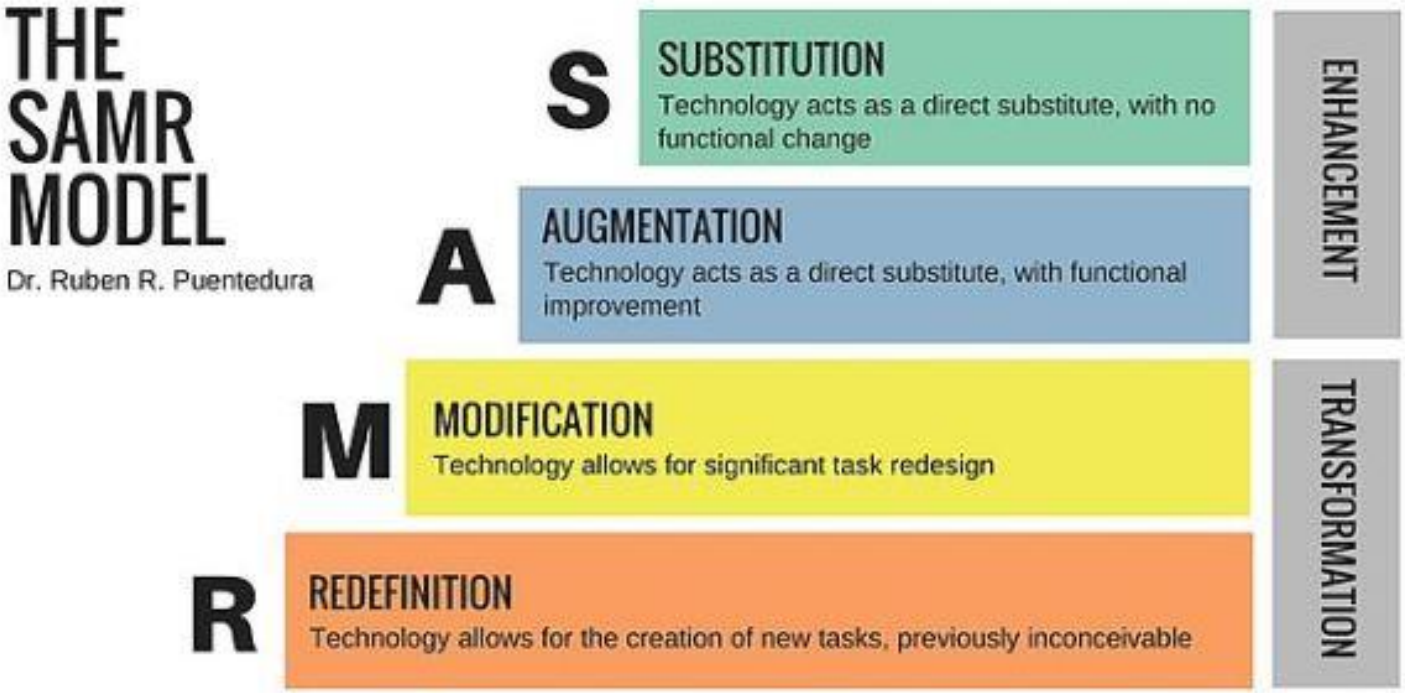
GOALS AND OBJECTIVES

The primary goal of this project is to integrate augmented reality (AR) and artificial intelligence (AI) into the curriculum to enhance student engagement, content retention, and learning outcomes. Specific objectives include:

- Enabling students to visualize complex concepts through immersive AR experiences.
- Utilizing AI to create personalized and engaging lessons.
- Improving students' critical thinking and problem-solving skills.
- Aligning lessons with Florida Standards to ensure educational relevance and rigor.

The source of my idea came from the need to engage, motivate, and help my students visualize Science concepts in the classroom. My idea was originally funded as an Innovator Grant sponsored the P.L. Dodge Foundation in 2019. 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. So now more than ever it makes sense to cross that comfort zone where teachers traditionally teach from and enter the 21st century Classroom. Educators today have had to not only step out of the classroom (and our comfort zone) to teach remotely through video conferencing tools such as Zoom during the pandemic but keep students engaged. But if all we do is just sit from our desks or front of the class 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.


THE SAMR MODEL
Dr. Ruben R. Puentedura
S
SUBSTITUTION
Technology acts as a direct substitute, with no functional change
A
AUGMENTATION
Technology acts as a direct substitute, with functional improvement
ENHANCEMENT
M
MODIFICATION
Technology allows for significant task redesign
R
REDEFINITION
Technology allows for the creation of new tasks, previously inconceivable
TRANSFORMATION

FLORIDA 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 elementary and middle school grades which can be utilized as an added resource when using Merge EDU applications.

ELEMENTARY SCHOOL STANDARDS

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.5.7 Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.

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

Image Credit: Merge VR

COURSE OUTLINE AND OVERVIEW

The primary goal of this project is to integrate augmented reality (AR) and artificial intelligence (AI) into the curriculum to enhance student engagement, content retention, and learning outcomes. Specific objectives include:

- Enabling students to visualize complex concepts through immersive AR experiences.
- Utilizing AI to create personalized and engaging lessons.
- Improving students' critical thinking and problem-solving skills.
- Aligning lessons with Florida Standards to ensure educational relevance and rigor.

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. Engagement in classrooms, especially in science classrooms, is a complex issue and can vary widely. However, according to a report by the National Science Foundation, the performance of U.S. students in STEM education continues to lag that of students from other countries12. A national survey conducted before the COVID-19 pandemic showed that **40% to 60**% of students were showing signs of disengagement in learning.

Using digital technology, such as augmented reality (AR) and artificial intelligence (AI) 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.

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 technology must also 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 Reality (AR) and Artificial Intelligence (AI) resources to enhance student engagement and learning. Here is a brief overview of the programs I used to engage my students.

USING AUGMENTED REALITY WITH MERGE EDU

Merge EDU is a hands-on digital learning platform that empowers students to learn science and STEM effectively using 3D objects and simulations they can touch, hold, and interact with. Here are some key features of Merge EDU:

1. **Interactive 3D Models & Simulations:**

- Merge EDU engages students in science and STEM by providing access to over 1000 hands-on digital teaching aids. These include interactive simulations that allow students to explore complex concepts visually and interactively.
- Students can hold and manipulate digital 3D objects, such as exploring a galaxy, investigating DNA molecules, dissecting virtual frogs, and more.
- The platform is designed for both classroom use and at-home learning.

2. **Curriculum Alignment:**

- Merge EDU's content is aligned with K-8 standards, ensuring that students learn relevant and age-appropriate material.
- It covers a wide range of topics, from basic science to advanced STEM concepts.

3. **Multisensory Learning**:

- The Merge Cube enables a multisensory learning experience by engaging visual, auditory, kinesthetic, and tactile senses.
- Students can naturally and intuitively interact with digital content, making learning more memorable and impactful.

4. **Spatial Development**:

- By manipulating and inspecting digital 3D objects, students exercise their spatial intelligence.
- Strong spatial abilities are beneficial for success in STEM fields.

5. **3D Creation and Printing**:

- The Merge Cube works with 3D creation software like Paint 3D and Tinkercad.
- Students can preview their 3D designs before printing, allowing faster design iteration and collaboration.

6. **VR Mode**:

- When used with the Merge Headset, the Merge Cube provides an immersive experience.
- Students can explore augmented reality (AR) and virtual reality (VR) content.

Whether in the classroom or at home, Merge EDU revolutionizes learning by combining digital technology with hands-on experiences.

USING ARTIFICIAL INTELLIGENCE (AI) WITH MICROSOFT COPILOT

Microsoft Copilot is one of M-DPCS protected AI tools, this means that the information which is fed within our District's Microsoft Copilot account is being kept within our tenant and not being leaked into an open AI web platform. As an AI assistant, Microsoft Copilot can help educators design engaging science lessons with Merge EDU in several ways:

1. **Lesson Planning**: Microsoft Copilot can assist in creating detailed lesson plans that incorporate Merge EDU's 3D models and simulations. This could include defining learning objectives, outlining activities using the Merge Cube, and suggesting assessment methods.
2. **Interactive Quizzes**: Microsoft Copilot can help generate interactive quizzes based on the 3D models and simulations in Merge EDU. These quizzes can test students' understanding of the concepts they've explored.
3. **Project Ideas:** Microsoft Copilot can provide ideas for student projects that utilize the Merge Cube and Merge EDU platform. For example, students could be tasked with creating their own 3D models related to a specific science topic.
4. **Integration with Other Tools**: Microsoft Copilot can suggest ways to integrate Merge EDU with other educational tools and technologies. For instance, students could use coding platforms to create their own simulations, then view them with the Merge Cube.
5. **Customized Learning Paths:** Based on the curriculum and individual student needs, Microsoft Copilot can help design customized learning paths that incorporate Merge EDU resources.
6. **Updates and Trends:** Microsoft Copilot can provide information on the latest updates and trends in digital learning, helping educators keep their lessons fresh and relevant.

Remember, the goal is to create a learning experience that is interactive, engaging, and effective. With Merge EDU and Microsoft Copilot's assistance, educators can truly bring science and STEM education to life.

SAMPLE SCIENCE LESSON AND STEP BY STEP IMPLEMENTATION GUIDE

Exploring Our Solar System Lesson Plan for 8th Grade Science

Objective: This lesson plan utilizes the Merge EDU Explorer application to engage students in a 30-minute exploration of our solar system, focusing on comparing and contrasting Earth with other objects (Mars, Jupiter, and Saturn).

Florida 8th Grade Science Standard SC.8.E.5.7: Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.

Materials:

- Device (tables or laptops) with Merge EDU Explorer App installed (applications are available within most District devices using Windows or an iOS operating system within the Company Portal)
- Student Worksheet with a chart for recording observations (one per student).

Introduction (5 minutes):

1. Brainstorming: Ask students what they already know about the solar system. Write their ideas on the board.

2. Standard Introduction: Briefly introduce SC.8.E.5.7, explaining that today they will explore the solar system and compare Earth to other objects (one other inner planet and two outer planets).

Exploration with Merge EDU (15 minutes):

1. App Introduction: Demonstrate the Merge EDU Explorer app, highlighting features such as viewing modes: 3D, Cube, World. Also demonstrate how to zoom, rotate, access information panels, and pinning.

2. Solar System Tour: Virtually tour the solar system with the class, visiting the Sun, eight planets and some moons (including dwarf planet Pluto).

3. Independent Exploration: Have students open the Galactic Explorer Topic Card with the Merge Explorer app. Go to Activity 1, Galactic Explorer, and click on the hot pink circle with the white arrow on the lower bottom side of the activity image. Students are to click on each of the different objects and explorer the information stored within the "I" icon.

4. Observation & Recording: Instruct students to use the app to record their information of Earth, Mars, Jupiter, and Saturn in the chart on their worksheet, focusing on distance from the Sun, solar orbit period, diameter, gravity, and facts. Encourage them to use the information panels in the app and discuss their observations with their partner.

Wrap-up & Discussion (10 minutes):

1. Class Discussion: Facilitate a class discussion using the following prompts:

• How does Earth's distance from the Sun compare to other planets? Possible answer: Earth is the third planet from the Sun and has an average distance of about 93 million miles (150 million kilometers). This distance is known as an astronomical unit (AU), which is a standard measure of distance in the Solar System. Mercury and Venus are closer to the Sun at 0.39 AU and 0.72 AU, respectively, while the outer planets like Jupiter (5.2 AU) and Saturn (9.5 AU) are much farther away.

• How does gravity differ between objects? Possible answer: Gravity varies between objects based on their mass and the distance between them. The more massive an object, the stronger its gravitational pull. For example, the Sun, being the most massive object in the Solar System, exerts a strong gravitational force on all planets, keeping them in orbit. On a smaller scale,

Earth's gravity is strong enough to hold the Moon in orbit, while the Moon's weaker gravity affects Earth's tides.

• Why does the Solar Orbit Period vary between planets? Possible answer: The Solar Orbit Period, or the time it takes for a planet to complete one orbit around the Sun, varies due to Kepler's laws of planetary motion. The farther a planet is from the Sun, the longer its orbit path and the slower it travels due to weaker gravitational pull from the Sun. Therefore, planets like Mars have a short orbital period of about 1.88 Earth days, while outer planets like Saturn take 29 Earth years to orbit the Sun.

2. Standard Review: Relate the observations back to SC.8.E.5.7. Emphasize how properties like distance from the Sun, gravity, temperature, and atmosphere contribute to the unique conditions on each object.

Possible teacher emphasis:

• Distance from the Sun: This determines the amount of solar energy an object receives. The closer an object is to the Sun, the more solar energy it gets, which can influence its surface temperature. For example, Mercury, being very close to the Sun, has high daytime temperatures, while Neptune, far from the Sun, has extremely cold temperatures.

• Gravity: The gravitational force of an object is determined by its mass and affects its ability to retain an atmosphere and influence surface conditions. A planet like Jupiter has strong gravity that can hold onto a thick atmosphere, while a smaller object like Mars has weaker gravity and a thinner atmosphere.

• Temperature: Temperature affects the physical state of matter on the object's surface and atmosphere. It can determine whether water exists as ice, liquid, or vapor, which is essential for the possibility of life as we know it. Earth's moderate temperatures allow for liquid water, while the extreme cold on Pluto means water exists only as ice.

• Atmosphere: The composition and thickness of an object's atmosphere can affect surface conditions, climate, and the potential for life. Earth's atmosphere, rich in nitrogen and oxygen and with a protective ozone layer, supports life and moderates our climate. In contrast, Venus has a thick

atmosphere of carbon dioxide that creates a runaway greenhouse effect, leading to extremely high surface temperatures.

These properties interact in complex ways to create the diverse range of environments seen across the Solar System, from the scorching surface of Venus to the icy moons of Saturn.

Differentiation:

• Struggling Students: Model how to find the information needed to complete the chart. If necessary, provide students with a pre-populated chart with some information already filled in to guide their exploration.

• Advanced Students: Challenge them to research a specific moon and present their findings to the class.

Extension Activities:

• Have students create a model or drawing of their assigned object, highlighting its key features.

• Research and write a short report on a specific planet or moon.

• Watch a short educational video about the formation of the solar system.

Assessment:

• Review student worksheets to assess their understanding of the key concepts.

• Observe student participation during discussions and exploration activities.

• Collect student reports or presentations (if assigned as an extension activity).

This lesson plan provides a framework for a 30-minute exploration of our solar system using Merge EDU. By combining hands-on exploration with scientific concepts, students will gain a deeper understanding of the diverse environments within our solar system.

Name ..... Date .....

The Solar System with Merge Explorer

Our solar system is made up planets, stars, dwarf planets, moons, asteroids, comets and meteoroids. The Earth, sun and our moon are all part of the solar system.

Instructions: Explore each object in our solar system using the Merge EDU Explorer app. Record your observations on two inner and two outer plants in the chart below.

Object	Distance from Sun	Solar Orbit Period	Diameter	Gravity	Fun Fact
Earth 					
Mars 					
Jupiter 					
Saturn 					

SC.8.E.5.7 Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.

Answer Key

Object	Distance from Sun	Solar Orbit Period	Diameter	Gravity	Facts
Earth 	1 AU	365 Days	12756 KM	9.8 m/s2	Earth is the planet we call home. Earth is one of the 4 terrestrial planets known to contain life.
Mars 	1.54 AU	1.88 years	6,782 KM	3.7 m/s2	Mars is the second smallest planet in the Solar System behind Mercury. Mars is named after the Roman god of war, and also called The Red Planet.
Jupiter 	5.21 AU	11.9 years	142,986 KM	25 m/s2	Jupiter is the largest planet in our Solar System. Together with the Sun, it represents most of the mass of our Solar System. Jupiter contains a Great Red Spot just south of its equator. It's a persistent anticyclonic storm that is larger than the Earth!
Saturn 	9.56 AU	29 years	120,536 KM	10.4 m/s2	Saturn is the 2nd largest planet in the solar system, with beautiful rings that extend up to 175,000 miles. Saturn was first observed by telescope by Galileo in 1610, but has been known since prehistoric times.

MERGE® Paper Cube

MERGECUBE.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 MergeCube.com

Visit **MergeEDU.com/shop** to purchase a real MERGE Cube.

Buy now

Download Merge EDU apps
www.MERGECUBE.com

Download apps

FOR EDUCATIONAL USE ONLY! | DO NOT SHARE THIS DOCUMENT - PLEASE SHARE THE URL: WWW.MERGECUBE.COM/PAPER | DO NOT MODIFY!

RESOURCES LIST

1. Innovation and School Choice AI Institute website: https://innovationschoolchoice.com/artificial-intelligence-institute/
2. Schoology Augmented Reality Group Access code: 22ZT-S73H-FZQS2
3. Merge EDU website: https://support.mergeedu.com/hc/en-us
4. Merge EDU Science NGSSS Standards by Merge applications:

- Merge Explorer : https://docs.google.com/spreadsheets/d/1ZPPgPyu5T7MEewiYFobW77CU7SdGS1Hcsu-Rj1rZKbY/edit?gid=0#gid=0
- Merge Object Viewer: https://docs.google.com/spreadsheets/d/1Tc4J_0HfG6vEeKW-kOrGEp8xJmaci43aJxUJrJaoehM/edit?gid=0#gid=0
- Merge HoloGlobe: https://docs.google.com/spreadsheets/d/1jVCS511xDccaDBl8XEFhf1exTt9Fw67sK4qGEauPD5U/edit?gid=0#gid=0

5. Printable Merge EDU Cube: https://mergecube.com/paper-pdf