JUMPING INTO THE

WORLD OF VIRTUAL & AUGMENTED REALITY

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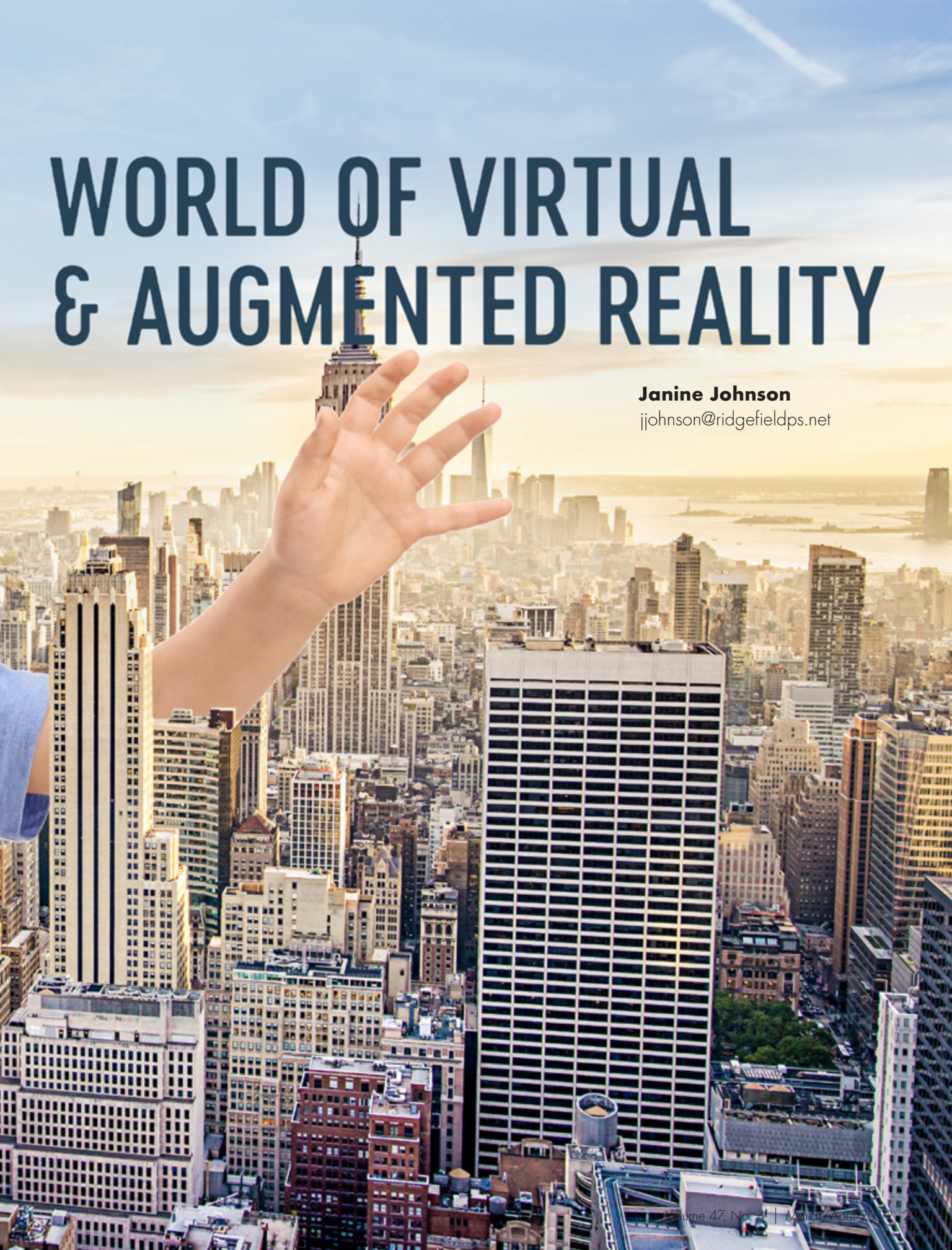

It has been three years since the *2016 NMC/CoSN Horizon Report: 2016 K–12 Edition* identified virtual reality as one of six developments in educational technology "very likely to drive technology planning and decision-making over the next five years" (NMC 2016, 6). Whether you have a well-equipped VR lab or are still questioning how to get started, you can be sure that virtual, augmented, and mixed-reality (VR, AR, and MR) experiences are not fads soon to fade away. Investment in this realm continues to increase. Goldman Sachs predicts fifteen million users will spend seven hundred million dollars in this area by 2025, with education one of the major drivers of this growth (Goldman Sachs 2016). In addition, research such as a recent University of Maryland report indicates improved recall with immersive experiences (University of Maryland 2018).

If that is the case, then what better place than the school library to "mess about" with VR/AR/MR and expand learners' horizons while seamlessly incorporating the AASL Shared Foundations of Collaborate, Explore, and Engage? We've been trying VR and AR at Scotts Ridge Middle School in Ridgefield, Connecticut, for the last couple of years. Like so many things we test out in our makerspace and learning commons, we started by experimenting with low-cost options. We believed that there was the potential for heightened student engagement and development of empathy with VR as one portion of a lesson plan, and that virtual reality experiences provided new and engaging learning opportunities beyond what a print book could provide.

I became convinced of the potential for engagement while using Google Tour Builder and Story Spheres at a Google Summit two years ago. The following spring I applied for and received a two-year Ridgefield Education Foundation grant. The grant would allow my tech-savvy assistant Emily Shiller and I to purchase a classroom set of Google Cardboard VR viewers and ten Nearpod teacher licenses for two years. Nearpod is an interactive presentation and assessment tool that also offers VR content in its lesson library. The Nearpod VR content would be a helpful first resource while we learned how to locate additional quality 360-degree images and video to support curriculum.

I curated high-quality content tied to curriculum and discussed VR as one component—tied to learning goals—in a larger lesson plan or unit with educators in my building. Students love traveling to locations around the world in our makerspace during recess, and an increasing number of educators at our school are incorporating VR and AR experiences in learning. VR and AR have proven their potential for engagement, particularly evident among Scotts Ridge special education learners. Last year these learners made significant improvements in their sensory detail writing after traveling to locations around the world using VR.

Students are motivated to include VR experiences in their learning. For example, of their own volition, social studies learners have chosen to include 360-degree immersive experiences rather than two-dimensional illustrations as part of projects. These students have also begun to create 360-degree content of their own. In a recent group presentation, a seventh-grade student pointed out how the group included "VR stores" in their model cities "so that those who can't afford to travel somewhere get the chance to go there." Through their

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experiences with VR, learners are making empathetic connections to the larger world. More about our experiences and reflections can be found later in this feature and at <bit.ly/SRMSLLCVR>.

So What about All Those Rs: Virtual, Augmented, and Mixed Reality?

AR layers something digital over what we see in our real world. *VR* is completely digital and could be a real 360-degree image or video that was recorded or a digital world that is digitally created. VR is completely immersive, meaning the viewer can look up, down, and all around to experience the image or video. *MR* modifies the experience relative to the user's surroundings, taking into account such things as lighting, obstacles, hand gestures, etc.

Getting Started

In a fall 2018 edWeb webinar, Jaime Donally, author of *Learning Transported: Augmented, Virtual, and Mixed Reality for All Classrooms*, pointed out the importance of connecting VR experiences with learning goals. Noting that VR viewers aren't mandatory for getting started, Donally said, "Simply looking at 360 images or video from a phone, Chromebook, or iPad can be a meaningful, personalized, and socioemotional experience for learners, but it needs to fit with the needs of the school and the curriculum" (Luhtala and Donally 2018).

VR Positives

VR supports opportunities to provide differentiated learning experiences, and, of course, learners love traveling and experiencing the world beyond the school walls with virtual reality. In addition, "The potential for building global empathy and literacy with VR is significant," according to Donally (Luhtala and Donally 2018). Fortunately, high-quality, diverse content is multiplying each day.

VR Challenges

Though professional-quality content is available, there is no one quick and easy curation tool or warehouse for high-quality 360-degree experiences tied to curriculum. The school librarian can help other educators and learners with their search for useful, high-quality VR content!

When looking for VR resources to enhance a lesson, I always start with YouTube's VR channel, search by subject, and then filter for 360. Simply searching "YouTube 360 <subject>" or "YouTube VR <subject>" might turn up a mix of true 360-degree videos and regular 2-D videos. Tip: If you're using viewers, open the videos in the YouTube app to be truly immersive. Click on the goggles icon to make videos stereoscopic. You can also use the VR Tube app, which searches for 360-degree videos only.

Good content providers to investigate include:

- Google Expeditions (history, science, and the arts)
- Discovery VR (people, places, and nature around the world)
- National Geographic 360 videos (science, exploration, adventure)
- Google Arts & Culture 360 videos (music, theater, visual arts, historic buildings, and more)

- 360Cities.net (cityscapes and countryside panoramas around the world)
- Nearpod VR (lesson library includes VR content only by subscription, but in the free version educators can add weblinks to 360 images)
- YouVisit.com (U.S. cities and college campuses)
- Seeker VR (science, technology, culture)
- NASA.gov (science on Earth and in space)
- AirPano (natural wonders and human-created structures around the world)
- News organizations such as ABC News VR, *New York Times* VR, CNN VR, *Life* VR, and PBS Video

Some providers require downloading their app to view content.

Viewer Options

If you'd like to obtain viewers to hold smartphones, you can have your learners create the viewers using pizza boxes or order viewers online. Amazon sells Google Cardboard viewers that are usually around $15 each. We like the View-Master Deluxe VR Viewer, which is close to $40, but is super-sturdy and has a button for advancing to a new location in Google Street View. Far pricier and more-immersive experiences are available with something like an Oculus Rift or HTC Vive, but these must be connected to a PC and limit movement. At Scotts Ridge, we just recently obtained two Oculus Go devices (at about $250 each) since they are more affordable than some other options and don't require tethering to a computer. Oculus Quest, with a forward-facing camera and two remotes, will be introduced—at about $400—sometime this spring.

If learners at your school are viewing individually, what device will they use? We try to collect discarded phones, and learners who have phones will typically share with others. We also use some of our library iPads. Learners can use the touchpad on a Chromebook to move around in a displayed image.

Going beyond Viewing

In the AR world at Scotts Ridge, since students have demonstrated their interest in VR and AR, we've been playing with low-cost MERGE Cubes and free apps such as ChatterPix, HP Reveal, and QuiverVision. MERGE Cubes are holographic cubes that allow users to interact with 3-D objects created through augmented reality technology. Initially, I thought the apps and games seemed pretty rudimentary. However, the potential for MERGE in education is growing, and new apps with meaningful classroom connections are being introduced at a rapid pace as developers add more content to the open-sourced MERGE portal <www.miniverse.io/home>. Recently, our sixth-grade science students used the HoloGLOBE app for MERGE Cube to explore the Earth and its systems in 3-D, and QuiverVision to make a 3-D volcano erupt!

The world of MR includes futuristic collaborative events, such as the virtual conferences in which we've taken part with Steve Bambury, head of digital learning and innovation at the British Jumeirah English Speaking School (JESS) Dubai. Steve regularly posts helpful links to 360-degree content, AR/VR apps, and creative ways his school is weaving VR into learning experiences. Find more at the sites listed in "Recommended Resources."

Climbing the SAMR Ladder

After seeing the potential for VR in enhancing learning experiences and how comfortable learners are with it, we've moved into the transformative realm of the SAMR (Substitution, Augmentation, Modification, and Redefinition) Model by creating 360-degree content to reveal students' understandings. Our learners are weaving stories and making connections using the Google Street View camera function to create original 360-degree images, then stitching them together and adding audio using Story Spheres. ThingLink allows learners to upload images and add links, text, audio, and more, but a subscription is needed to upload 360-degree images. Google VR Tour Creator allows learners to create their own VR tours using 360-degree images from Google Street View or student-created images.

In a recent project, seventh-grade students wrote fictional final chapters resolving world conflicts after reading Newsela articles and researching conflicts such as those in Israel and Palestine, India and Pakistan, and North and South Korea. Images on the front cover of the book jackets they designed triggered the students' video booktalks using the AR app HP Reveal (formerly known as Aurasma). Some of these examples are profiled on our grant website at <bit.ly/SRMSLLCVR>.

Last year we worked with an eighth-grade social studies teacher to have learners app-smash with Chatterpix

and HP Reveal as part of an Industrial Revolution unit. ChatterPix allows learners to outline the mouth in their image, make the mouth move, and sync recorded audio to the movement. HP Reveal allows them to select the trigger image that would launch video.

Our learners have journeyed through the canals of Venice; visited religious sites around the world; traveled to Senegal, France, and Vietnam; traveled through the human body; hovered over erupting volcanoes, and more. They've explored well beyond the walls of our library! Learners' reflections speak to the opportunities presented by these experiences:

- It will help me remember it better.
- It helps show me what is happening, which causes me to ask more questions.
- If I'm just looking at a picture, I can only see that one picture. If I'm looking with VR, I get to look wherever I want. It expands the picture to the point where I'm not just looking at something, I'm in something.
- Was virtual reality created to let people travel to places that they never will in real life?
- What other inventions like VR can help people live better lives?

These last two questions above speak to one of the most important features of incorporating virtual and augmented realities into learning: provoking learners to think deeply and with empathy. According to Jaime Donally, "Limits we have in the real world are no longer limitations in our classrooms" (Luhtala and Donally 2018).

Help open up the world to your learners and dive in!

Janine Johnson *is school librarian at Scotts Ridge Middle School in Ridgefield, Connecticut. She was a member of the Scotts Ridge team that won AASL's 2018 Collaborative School Library Award. In 2018 she also received the Connecticut Association of School Librarians' Carlton W. H. Erikson Award. In 2018 she contributed "Collaborating with Teachers to Inspire Independent Learning" to the* Knowledge Quest *blog and coauthored (with Jessica Burns) "Conflict Book Covers: What Truly Sells a Book" for the blog* Learning Personalized. *She is a member of AASL.*

Recommended Resources:

Jaime Donally (@JaimeDonally @ARVRinEDU) provides links to helpful VR-related information at <https://twitter.com/ARVRinEDU>. Jaime's book *Learning Transported: Augmented, Virtual, and Mixed Reality for All Classrooms* (ISTE 2018) provides a good introduction to planning for and using VR in instruction.

Kathy Shrock offers tips on using AR and VR effectively in the classroom at <www.schrockguide.net/augmented-reality.html>.

Michelle Luhtala and Jaime Donally, edWeb webinar "Get Real! Augmented, Virtual, and Other Realities in the Classroom" will be of interest to anyone considering use of AR and VR in education <https://home.edweb.net/webinar/emergingtech20180926>.

Steve Bambury (@steve_bambury @JESSDigitalUAE #CPDinVR) tweets about VR/AR in education and offers free PD sessions; learn more at <www.virtualiteach.com/cpd-in-vr>.

Scotts Ridge Middle School Grant website, *Going Virtual: Deepening Learning with 360° Resources,* offers content, resources, and reflections at <bit.ly/SRMSLLCVR>.

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