

# PRACTICAL CONSIDERATIONS FOR IMPLEMENTING VIRTUAL REALITY IN ARTS EDUCATIONAL SETTINGS

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The presence of Virtual Reality (VR) technology in arts education is growing. At North Carolina State University, a collaboration project between the Raleigh Civic Symphony plus NC State faculty and students, featured the VR experience [Our Voices Will Be Heard](#) with a live symphony performance in the background. In healthcare, VR is being used to [simulate human interactions, assist in diagnostics, mimic surgery procedures, provide therapy treatment, and many more](#). In London, the Tate Museum featured [a temporary VR exhibit for viewers to explore Modigliani's art studio in the final moments of his life](#).

From museums to live music to healthcare and many more, VR beginning to change how we perceive the arts and learning. After all, this immersive experience has been proven to enhance the learning experience, [achieve a higher retention of knowledge](#)<sup>1</sup>, and is quickly changing the learning environment. VR has an incredible potential, and as the technology develops and we find news ways to incorporate it into our daily lives, arts teachers and organizations may also develop ways to incorporate the same technology into their classroom instruction. When done effectively, the lesson is transformed, and students gain much more knowledge and experience than before. For arts classrooms such as music, dance, visual arts, etc., arts can be made more accessible, and students gain a higher understanding of their artform.



Image 1: A young child explores around a VR space while wearing a standalone VR headset. Source: Pixabay

In this report, we'll strictly focus on VR technology as an example in ways that technology can enhance a learning experience. Also, this report, rather than focusing on ways to incorporate VR into lesson plans and instruction, will look at considerations in obtaining VR for educational spaces.

### Why Should I Use VR in My Classroom?

An eventual goal for virtual reality companies is to have VR technology integrated in every home. According to Dr. Skip Rizzo, a clinical psychologist and inventor of [Bravemind](#), the VR therapy tool used to access and treat PTSD, VR technology will grow to the point where its function in a household will be similar to a toaster: while it may not be used every day, it will still be considered a vital appliance to own.<sup>2</sup>

VR experiences are already beginning to make their way into educational spaces, and their results are exceeding expectations. For example, Carnegie Mellon University's Entertainment Technology Center recently launched [Project Voyage](#). Project Voyage, built at the request of the teachers of Cornell School

<sup>1</sup> abbyr, "People Recall Information Better Through Virtual Reality, Says New UMD Study."

<sup>2</sup> "3.5 - VR: What's Possible in Reality?" 2018.

District, was designed to allow students to explore environmental biomes. The VR experience takes place in a deciduous forest setting and includes features to explore, read more information on certain plants and animals, and go on a scavenger hunt. Students participate by logging on, choosing a username and color for their avatar, and then venturing off to explore the area as one collective group or in predetermined teams. The teacher monitors each student or team's progress on an iPad. Kristopher Hupp, director of Technology and Instruction Innovation at the Cornell School District, commented on the success of the project by mentioning that Project Voyage "far exceeded any of their expectations" and that "their students will certainly never forget their lessons about biomes."<sup>3</sup>

To create Project Voyage CMU's ETC students worked in teams to build the VR environment and program the learning materials in the experience. The environment's design is more simplistic to prevent any issues with software crashes or lag. The experience is also designed to keep communication open between all students and the teacher, including inside the VR experience. In addition, the teacher is also able to move the entire group to a different environment for exploration at any time.

While overall VR has not yet become a core part of educational learning, considering the successful trends, continuous experimentation, and even cost-effectiveness in comparison to other learning tools, it would not be unlikely to see VR in many educational spaces such as Project Voyage within the next couple of years.

### A Barrier to Obtaining VR

Of course, with many types of educational technology, the greatest barrier to obtaining

and using it is within the organization's ability to afford it. In a recent AMTLab article by Lydia Killian, [examples of technology to help students with developing practice habits or measuring personal assessment](#) are available to increase learning outcomes and heighten their musical experiences. However, this same article identifies lack of financial support as a significant barrier in obtaining this technology.<sup>4</sup>

Certainly, as VR technology ages and becomes more cost-efficient as its hardware becomes outdated, then there is indeed a future where all schools can have access to VR and its educational benefits. However, if a school or an arts education program wants to take advantage of this now, barriers such as funding may block this pathway. This is particularly dangerous because, if there is an abundance or a lack of funding for new technology for some schools, then an inequality in education is created.

Currently, three solutions exist for an education organization to afford VR technology: grants, affordable headset options, and building/using a designated VR space.

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<sup>3</sup> Hanna Jang, "ETC Students Create Collaborative Virtual Reality Experience."

<sup>4</sup> Killian, "Using Technology to Assess Students in Music Education Programs."



Figure 1: Comparing and contrasting the costs of educational technology, including VR headsets, iPads and tablets, learning management systems, and SMART boards. Infographic created by Alyssa Wroblewski via Canva.

## Applying for Grants

Currently, the quickest solution available for schools to obtain VR technology is by applying for VR/technology grants. Grants may be available at the federal, state, and local level for schools or arts institutions to apply for. This includes grants for obtaining VR hardware such as the [Technology Teacher Grant by Verizon Fios](#), or the [U.S. Department of Education's EdSim Challenge](#) for creating an idea for a VR prototype. At a local level, [one school in North Carolina had their HTC Vive system funded via a grant from their local Rotary Club](#).<sup>5</sup> *Our Voices Will Be Heard*, the VR/live orchestra performance hosted by North Carolina State University, was able to purchase their headsets for the performance thanks to the college's [Sustainability Grant](#). With this, institutions can obtain a little or large amount of funding to purchase VR equipment or have the learning technology

developed.

An excellent resource to start with for finding grants is the [US Department of Education's Office for Educational Technology website page on Funding Digital Learning](#). The page gives details on federal funds, state funds, local

<sup>5</sup> Schaffhauser, "North Carolina School Adds VR Headset System for STEAM Education."

funds, and outside grants to encourage efficient researching. In addition, the page asks a variety of questions to serve as a guideline for writing an application. Finally, a sample Dear Colleague Letter is available for download and viewing to help advocate for a new technology program in an education space.

### Affordable VR Hardware – Advantages & Drawbacks

VR hardware such as the [Google Cardboard](#) or [Samsung Gear VR](#) headsets are currently available for purchase. These standalone headsets only require a smart phone to be placed in the headset plus any VR apps or games downloaded on the phone. While a prerequisite is for each user to own or borrow a smart phone to use, these headsets might be an option for many schools attempting to integrate VR in their curriculum. Starting at around \$15-\$150 per kit, it is far more affordable, accessible, and less complicated than its full VR counterparts.

However, along with the smart phone prerequisite, the main issue with these standalone headsets is that it only provides an introductory experience to VR. The technology is limited to a smart phone and the apps available on it; in comparison, fully immersive VR uses a PC to access games and higher-quality experiences. If the smart phone happens to be low quality, then the quality of the experience already becomes limited. Standalone equipment may also be uncomfortable for a user after a period of use. Equipment such as Google Cardboard make it so that the user must hold up the equipment to their heads. For other headsets, a significant amount of weight is forced upon the user's head, which may be uncomfortable for muscles and circulation.



*Image 2: The author exploring VR controllers on the HTC Vive. Source: Author.*

To obtain the fully immersive VR experience, institutions would need to purchase equipment such as [HTC Vives](#) and [Oculus Rifts](#). This equipment includes controllers and cameras for users to interact more with their environment. In addition, because the technology is connected to a PC rather than a smart phone, the number and quality of games, experiences, exploration, and capacity greatly increases. They are more easily sanitized and cannot be broken as easily. Of course, the biggest tradeoff to using this equipment is the price to purchase a full package: typically, around \$399-\$799. In addition, a set space is needed for the user's environment.

### A Solution to Standalones vs Fully-Immersive VR? Combine Them.

On May 21, 2019, the [Oculus Quest](#) will be available for purchase as the new VR headset that combines quality computer capabilities with standalone design. The headset comes without wires or boundary cameras as part of its package, yet it can still function entirely on its own as a fully immersive VR headset with controllers, similar to the HTC Vive. Benefits include the simplicity of the package; no wires eliminate tripping hazards and increases user mobility. The headset is also battery operated and lasts for an estimated 2 hours. Finally, the Quest is currently available at \$399, making it





The downsides to the Quest include the lack of software available along with picture quality. For example, in the video game industry, while around 500 games can still be played on the Quest, the picture may be more pixelated, and high intensity games currently require the full VR package that includes wires and boundary cameras. The Quest is also quite heavy and can be straining to the neck and head if not adjusted properly.

While the Quest is not quite the solution educators and administrators are looking for, it is certainly a great step forward. It is also proof that VR equipment is developing further and quickly. It might only be a short matter of time before another package is introduced that is immersive, affordable, and practical towards an educational space.

## Using/Creating a Public Space

If you are looking to purchase VR equipment for a school space, the first thought that usually comes to mind is each student in a classroom space having their own VR headset. However, similar to a computer lab, another way to approach obtaining VR is to take it out of the classroom and place the equipment instead within a specified space.

Examples of public VR usage include several places such as museums or [VR arcades](#) that already house the technology. Likely, however, this as part of an exhibit and/or for an admission fee. Another example is VR Technology Labs that are hosted within a space such as a library. For a school, however, if there is a VR Station Area within the grounds that a group of students may use VR, then this could be far more cost efficient than providing VR equipment for every kid in every classroom. Maintaining the space and equipment, plus supervising students while the equipment is in use, would be made easier as well.

Figure 2: Figure 2: Comparing the complexities of different types of VR equipment such as cardboard, standalones, fully immersive equipment, and even equipment such as VR treadmills. Infographic created by Alyssa Wroblewski via Canva.

the most affordable option of the fully immersive VR packages.



Image 3: An example of users within a VR theater. Source: Wikimedia Commons

While this may not be a solution for integrating it heavily within a curriculum, it still allows for a large population, including students, to access the technology. If VR is to be introduced in this way, then it is vital that the system's software and hardware be well-designed to match this. In this way, VR has low barriers to entry, is more public, and is more accessible, but having the system well-designed to fit the area and need it is presented in is critical in preventing counter-productivity.<sup>6</sup>

### Tips to Consider for New Users in VR

At first, VR can be confusing and intimidating for first-time users. Therefore, supervision and/or instructions to make the experience as seamless as possible is vital. An example of this is during the author's first time with VR at [Carnegie Mellon University's VR Office Hour at Sorrell's Library](#): two supervisors were always available to assist with placing and removing VR equipment, making sure wires were not presenting a tripping hazard, guiding users through the software and apps, and answering any questions a new user had.

For a standalone headset with smartphone capabilities, two senses are transferred into the

virtual reality: sight and hearing (via earphones). Fully immersive VR includes the additional sense of touch: with controller added in plus a small boundary space to walk around in, users will feel much more placed in a different world. Because of this, it is important to note that a user may need time to transition from VR back to reality after a particularly engaging experience.



Image 4: The author using VR controllers in the Steam VR Tutorial

Another aspect to note for fully immersive VR is that it takes a while for first-time user to get used to the controls. In-person tutorials or in-game tutorials such as the Steam VR Tutorial by Valve may assist with this to greatly reduce a learning curve and allow the user to enter the full experience quicker. At first, a new user may want to take time to explore and experiment with the VR space and new controllers.

For fully immersive VR, there is not a concern for any danger that a user is in in terms of the environment. Most games and experiences keep track of the user's position within the designated space. Therefore, if the user is about to go outside of the boundary space (or potentially crash into a wall), the equipment

<sup>6</sup> Games for Change, "Future of Work: The Role of Tech and What You Should Know."

will warn the user first. Motion sickness is not usually a concern as well unless the VR software is not good quality.

## Conclusion

Before an institution can begin advocating, purchasing, and using VR equipment for their educational space, it is vital that the organizer come up with a solid plan for how to use the tech, the benefits of using VR over other tech, and how to measure each lesson's/experience's success. It is important to consider the headset

needed for your goals. Plus, consider as well if a custom-built program is needed, such as Project Voyage, or if it is possible to use an existing program for learning outcomes. Once this plan is formulated, it is certainly feasible and beneficial to use VR in the education space. VR will continue to grow and develop, such as the new Oculus Quest, and as it becomes more common, the potential for success and impact in education will also develop. The time to embrace VR technology and education is now, and its success will continue to prove itself wherever it'll go.



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