

Applied VR in the Schools, 2016-2017, Elementary

Findings: Interest in Virtual Reality

Foundry10 is particularly interested in the applied use of virtual reality in education as the use of technology in education has historically had varied results. Some of that variance is evident in the assessments both students and teachers give of its relative usefulness in the actual classroom environment. It is all well and good to say that a technology will change the way classrooms function or how kids learn, but it is very different to demonstrate that the technology actually affects classroom learning. We believe that student and teacher voices are extremely important when assessing the relative value of technological interventions in classroom environments. In our experience, teachers and especially students are extremely candid about their experiences in real classrooms and open with their criticism. We have also found that students and teachers are incredibly thoughtful about their responses and tend to highlight things that adults external to the classroom environment might assume or inadvertently overlook.

Although we have not worked extensively with elementary students, in this initial iteration of our study we partnered with two elementary schools that expressed interest in using virtual reality. We were intrigued by whether or not elementary students were interested in using virtual reality and why. Though we did donate virtual reality equipment to the schools for the purposes of study we were unable to gather post data successfully from the two sites. We have altered our methodology for future work with elementary to better capture post-responses from the students. However, we feel that exploring student interest about an emerging technology, such as VR is still useful and we will build off of our findings from the interest survey in our 2017-2018 study of elementary students and virtual reality.

One of the schools had tremendous challenges implementing VR in their school despite the support foundry10 provided. We think it is an informative cautionary tale for schools who are eager to introduce an emerging technology in a school without the infrastructure to support it. Additionally, we think it is important to consistently highlight the need for teacher buy-in and IT support for new technology adoptions. The two elementary schools used only Google Cardboards, so this was not an advanced headset study. However, this also draws attention to the fact that even implementing and integrating Google Cardboard effectively is no small task and careful consideration should be given to teacher readiness and implementation.

Below is a summary of the findings from the two elementary schools who participated in the 2016-2017 study.

General School Backgrounds

The two elementary schools came to the study as recommendations of another teacher that had previously been involved in a foundry10 study. One school, a rural school in the Mid-west had a very enthusiastic administration who was planning some substantial changes to the way technology was being used in the K-6 school. The administrator had been in contact with another teacher involved in our VR research and was eager to make a notable impact on the school, to which he was new, and its overall use of technology. There had been a number of hiring changes at this school and there was a large push to take on several large technology projects, one of which was this study. Three teachers from the school were presented to us as candidate teachers for the study. One of those teachers was very excited about the opportunity and the other two were a bit more apprehensive. We spent a great deal of time working with the administrators and the most motivated teacher trying to get VR situated within their school. It was clear almost immediately after signing the agreement to be part of the study, that the shift from the administrator to the teacher was not smooth and the teacher did not feel empowered to make decisions and get the IT support needed to be successful. Although we did try to intervene on behalf of the teacher (and even sent a staff member out to help get it up and running and to do an in-school community event with an advanced VR headset) the program was not off to a strong start. Ultimately, this school dropped out of the study, lost the administrator involved, lost the teacher who was motivated (one of the other teachers went on leave and the third did not fully understand why he was asked to use VR with his students) and ended up likely not using the equipment at all. Further discussion about the failure to successfully implement VR, as Google Cardboards with elementary students, will be addressed below.

The other school was a suburban school on the west coast. The interested party in this group was actually an educator who had done quite a bit of research on VR and was very intrigued about giving his students, particularly his special needs students, the opportunity to engage with virtual reality as a tool to expand their understanding of several classroom topics. The teacher knew what he wanted to use but was open to a variety of types of VR. He was very responsive and felt in control of what was happening from the very early stages.

As a result of losing a school mid-year, and having that school be the larger sample size, our data analysis is focused on data collected at the beginning of the school year. However, we would still like to share and discuss the students' responses as well as the teachers' observations. We will then attempt to highlight some possible reasons for the failure of the one program and explore how we have already made changes to how we will approach it moving forward.

Pre-Elementary Findings

We had 130 respondents on the pre-elementary survey, with 100 responses coming from the school in the midwest and 30 responses coming from the school on the west coast. 54 students identified as female, 63 as male and the remaining 13 chose other. The Midwest school had the

2nd and 3rd graders, with some 4th, 5th and a few 6th. The West coast school was predominantly 5th and 6th graders (Figure 1).

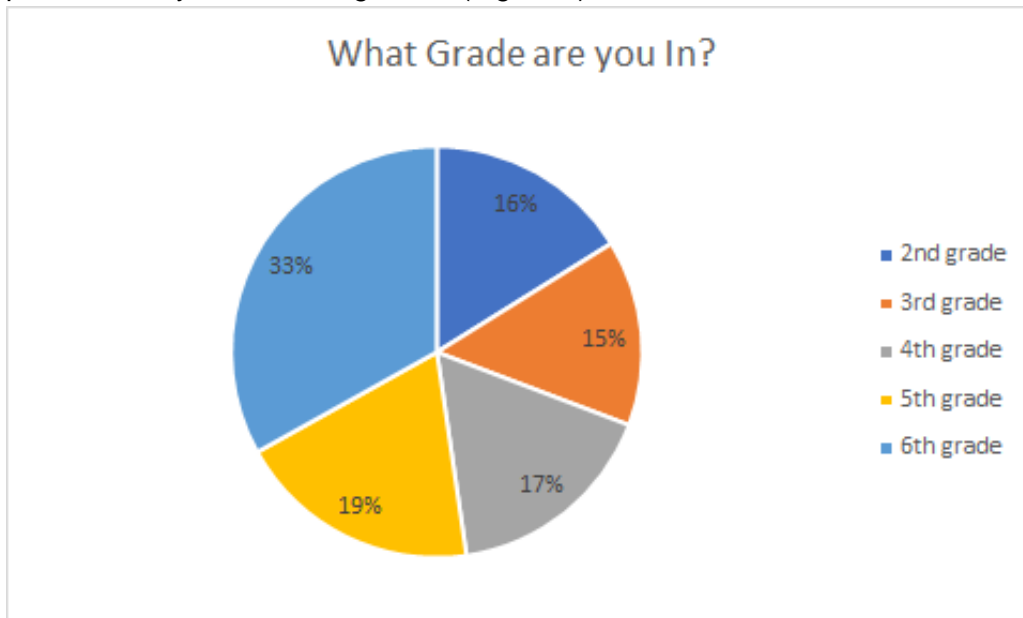


Figure 1. The grade level of all 130 students involved.

When asked whether students knew what virtual reality is, there was quite a range, the majority of students either saying they were not sure, or feeling pretty strongly that they had an idea of what virtual reality is (Figure 2).

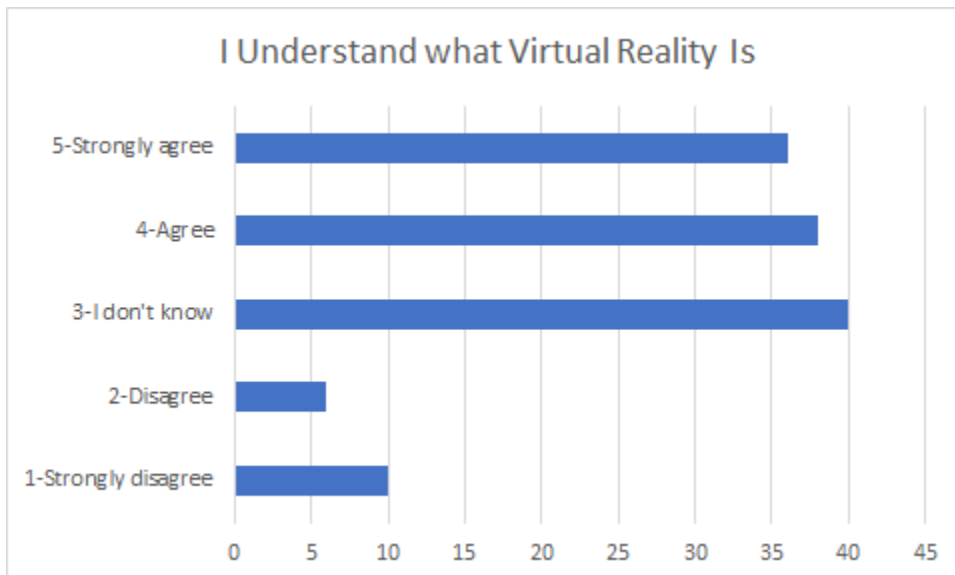


Figure 2. How well the students felt they understood what VR is before they were introduced to the hardware in their schools.

These are similar findings to those we had with elementary students attending a Minecraft event where we staged a VR showcase. Due to the popularity of YouTube among older elementary

students, many of the children we interacted with did have an understanding of what virtual reality was, simply by watching their favorite YouTubers experience it, than we would have expected given their limited actual experience with VR.

Although excitement is only one component of the positive integration of virtual reality for learning it is a characteristic that makes it appealing for students. With older students, middle school and high school we have sometimes seen a bit of hesitation from students who weren't sure what to expect. At the elementary level, the findings were clear, students really did want to engage with VR. 75% of students indicated that they were excited about using VR (Figure 3).

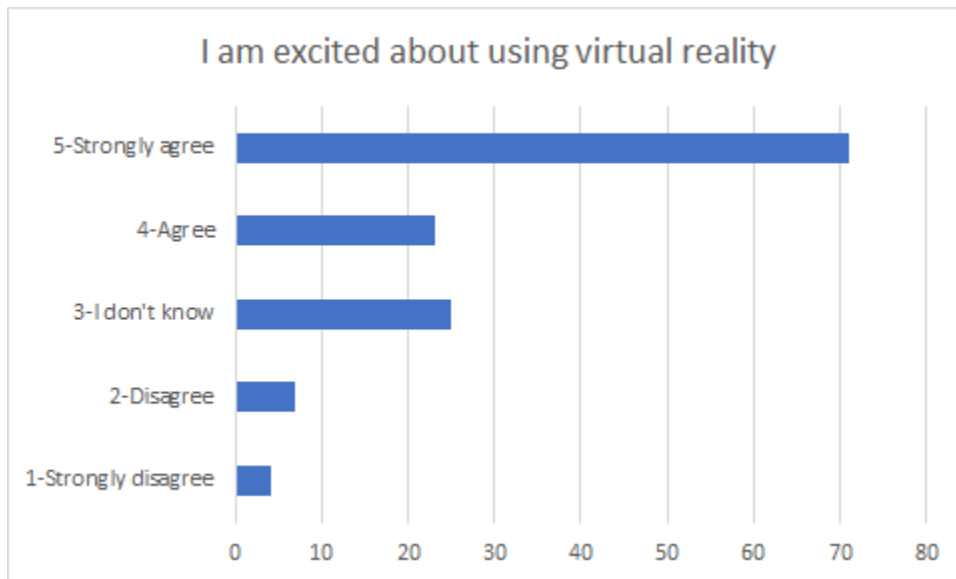


Figure 3. How excited the students were about using VR hardware before they were introduced to it in their classrooms.

We asked students to predict, given what they know (or think they know), about virtual reality, how they might conceptualize of it across a range of areas (Figure 4). It is interesting to note that the vast majority of students wanted to do VR and thought it would be different than their regular class. We find this intriguing since VR really is a different medium and likely would provide opportunities to do something different within the regular classroom environment. The majority of students did not anticipate that VR would be fake, scary or boring. It is interesting to note, however, a perfectly even split on whether or not VR would make learning more exciting. In other studies we have run with VR we have observed that students are not always certain how to frame VR within an educational context. It may be, that prior to using it, they truly are not sure how it will intersect with their regular learning, even though they predict that it will be different than the normal classroom.

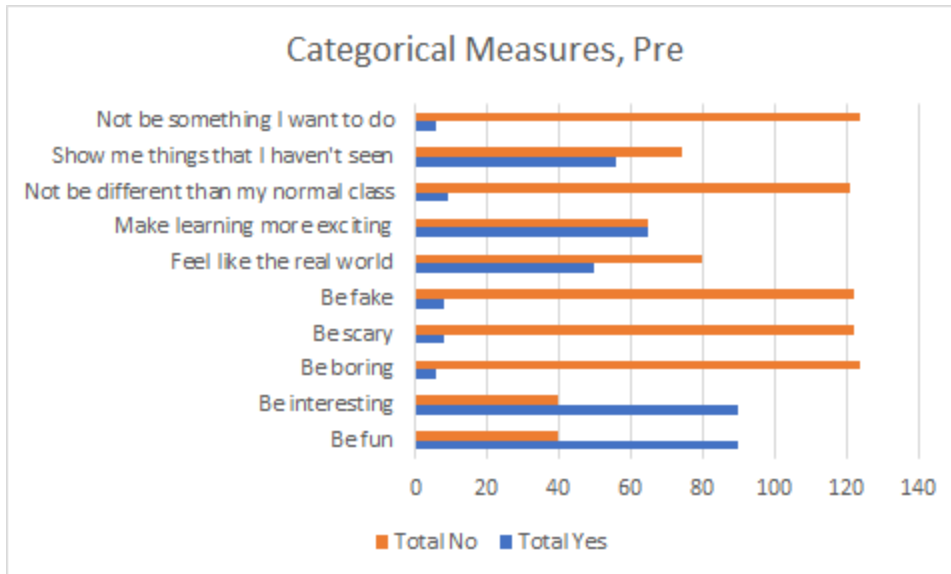


Figure 5. On a range of scales explaining potential reactions to VR, this figure shows the students' perceptions before they were introduced to VR hardware in their classrooms.

As baseline information, we also asked elementary students to share how often they play video games. It is clear that students at these two elementary schools are active video game players (Figure 6).

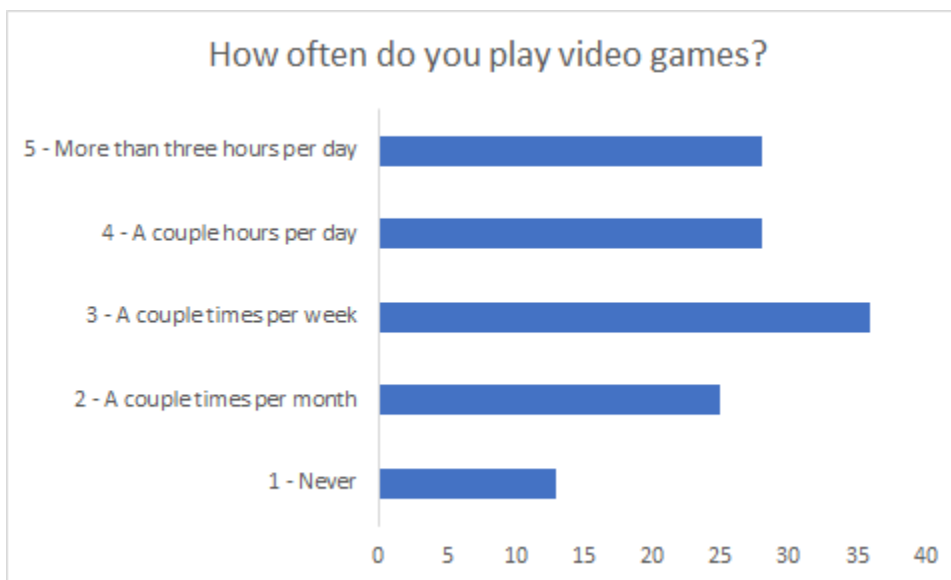


Figure 6. How often the participants played video games. This data was collected before they began using the VR hardware in the classroom, so that is likely not included in their estimates.

In previous work we have found some correlation between limited video game usage and hesitation about VR. In terms of VR being perceived as scary, prior to using it, there was no relationship to video game exposure. Nor was there a consistent relationship between not wanting to try VR and prior video game usage.

Finally, in the pre-surveys, we asked students to identify in an open-ended response format what was most exciting to them about experiencing VR content. 21 students expressed interest in experiencing new places that are not otherwise accessible and an additional 11 felt that traveling in VR was something they were excited about. 29 students felt that the appeal of VR was that it is fun and exciting. 6 students felt that an exciting element of VR was that it would be like the real world.

Teacher Interviews

While we were unable to collect survey data from the youth participants after the school year, we still had a fruitful conversation with two teachers at the beginning of the year (midwest and west coast school) and in the middle of and at the end of the school year with the west coast school.

At the beginning of the year, teachers were just as excited as students about the potential for VR use in their classrooms. In particular, they were excited to give their students the chance to use technology they otherwise would not have access to. Both teachers also cited that VR technology would make their classrooms more global. The midwest teacher said she was able to take her class on a more global excursion by going to York, England and connecting a setting to the book Harry Potter. Which she said made them “interested in an inter-disciplinary way through Harry Potter and magic but also ‘normal’ facts [about the location]”. The west coast teacher was excited to take similar trips, highlighting that he hoped through virtual reality technology his students would “understand the content more fully...getting a better depth of understanding”

Although the teachers were excited about the enormous potential for VR use in their classrooms, they were also apprehensive about introducing a new technology to their students. The teacher from the midwest shared that she thought VR would be used “haphazardly” until it was fully integrated into schools as an educational technology. She was concerned about not having enough equipment for the interests or needs of her students and the impact of only having one or a few classes in the school using VR. The teacher from the west coast was more concerned with more micro level classroom issues with the technology. Primarily, that the noise in the classroom and distracted students would mean the immersive experience was broken for all students.

Although we don't have data which follows up with the teacher at the midwest school as they dropped out of the study, we do have rich interview responses from the west coast teacher. When we checked in with him throughout the year, he shared that the VR technology has led to “a broader interest in the students. They've wanted to do more in depth into topics with VR.” This teacher was able to use VR alongside more traditional methods of teaching. He described how he “created an assignment from the 360 pictures and integrated their reading books. They would go and take trips to wherever they were reading.” He found that when the students were able to connect with material in deeper and more meaningful ways when they could read about

what they were learning, talk about it and see it for themselves from a first person perspective. The teacher said this heightened learning came from a higher level of engagement which allowed them more time and space to explore.

Even though the VR technology did allow for greater student engagement in some areas, it was not without its difficulties. It took this teacher a lot of careful planning to be able to integrate VR technology into his classroom considering limited amounts of technology. In one interview he said that the biggest struggle with implementing VR was the minor technical issues that broke the immersion and experience for some students. These things included not having enough devices for all students, and if the students didn't have a device that day making sure they could see the experience on the chromebook. The use of VR technology in the classroom, like any other vehicle for learning, takes some strategic scaffolding and implementation on the part of the teacher.

Even though there were some technical concerns, by the end of the year, the west coast teacher said that VR in his classroom was "no longer supplemental, it's turned into having an experience with everything I teach". He found that despite his initial concerns about student engagement and tech issues he had throughout the year, he was still able to use the cardboard technology to engage his social studies class. At the end of the year when this teacher was asked if the impact of VR was valuable in his classroom, he said it did and explained "Other than them sitting around and reading from a book or designing they're actually moving around and experience at least a glimpse of what other people were like and other cultures." Even though they were able to move around and interact a little more than a book would allow for with people and places, the students were still frustrated that they couldn't fully walk around and explore places they took google field trips to. They wanted to see interactive videos and engage with the places they were visiting, which was a new level of engagement the teacher observed after VR use.

Conclusions and Future Work

In the 2016-2017 iteration of our study we worked with these elementary schools within the broader context of our applied virtual reality study. Even though this data set is not complete, there were logistical issues retrieving post information from the west coast school from the end of the year and the midwest school dropped out of the study entirely, we learned a lot which we are excited to take into our study next year. In the 2017-2018 applied VR study we will be working with four elementary schools across the United States and are focusing on ways to make the study more directly applicable to elementary students and teachers. This study was the first step in grounding a body of research on the use of virtual reality in elementary school classrooms. Although there were some issues with the technology, the students were excited about the possibility of adding this technology into the school day and teachers found it enhanced learning. We are eager to see if these results hold true across a larger sample size in our 2017-2018 study.