2018 VR/AR in Research and Education Survey
Which VR/AR technologies are in use at your institution?

- Google Cardboard: 75%
- Oculus Rift: 53%
- HTC Vive: 45%
- Samsung Gear VR: 33%
- Microsoft Hololens: 29%
- Oculus Go: 25%
- Windows Mixed Reality: 12%
- CAVE: 6%
- Meta: 4%
- Lenovo Mirage Solo: 4%
What best describes your institution's use of VR/AR?

- Fully Deployed, 18%
- Some Deployment, 28%
- Testing, 32%
- No Deployment, 22%
Applications

- Field Trips – 61%
- Content Creation – 59%
- Special Education – 20%
- Training – 39%
- Medical – 31%
- Recruiting – 27%
- Collaboration 27%
- New Pedagogies
For what applications is VR/AR being used at your institution?

- Virtual field trips: 61%
- Content creation: 59%
- Data visualization: 51%
- Hands-on training: 39%
- Medical education: 31%
- General collaboration: 27%
- Recruiting/campus visits: 27%
- Distance learning: 22%
- Special education: 20%
Who is using VR/AR at your institution?

- Students outside the classroom: 63%
- Faculty for instruction: 61%
- Students in the classroom: 59%
- Faculty for research: 49%
- Staff for administration: 10%
Biggest Barriers to Adoption

#1 Cost

#2 Lack of content

#3 Lack of awareness
When does your institution plan to deploy VR/AR as a part of your production IT environment?

Using Today, 27%
1-3 Years, 31%
<12 Months, 22%
>3 Years, 14%
Never, 6%
How are VR/AR technologies deployed at your institution?

- Dedicated Space: 55%
- Mobile Carts: 26%
- Ad-Hoc: 51%
- Check Out: 38%
Top Infrastructure Concerns

#1 Upgrading PCs
#2 Physical Space
#3 Wireless Network Capacity
Does your institution have any of these VR/AR activities?

- Department with VR Focus: 37%
- Classes on VR/AR: 25%
- Department with VR Content Dev Focus: 25%
- Degree Program in VR/AR: 4%
Top Benefits of VR/AR

#1 Visualizing difficult concepts
#2 Enhancing student engagement
#3 Improving learning outcomes
#4 Enabling field trips
#5 Encouraging creativity
Bandwidth Endgame

- Human eyes can detect dots at 0.3 arc-minutes of arc degree, that is about 200 pixel per degree
- For full 360 degree horizontal and 360 degree vertical there are 5 billion (giga) pixels
- 36 bits/pixel for full color = 18 billion bits = ~21GB for still image
- For motion, target 120 frames per second
- Total bandwidth ~20Tbps (uncompressed)
- Storage is a problem too: 1 minute = ~150TB (uncompressed)
- With 600x compression, 33.5Gbps (compressed)
- 1 minute = 250GB (compressed)

With thanks to Cedric Westphal, Huawei
Bandwidth Endgame- 3D

- Human eyes can detect dots at 0.3 arc-minutes of a degree, that is about 200 pixel per degree
- For full 360 degree horizontal and 360 degree vertical that’s 5 billion (giga) pixels
- 36 bits/pixel for full color = 180 billion bits = 21GB for still image
- x2 eyes = 42GB

- For motion, target 120 frames per second
- Total bandwidth ~40Tbps (uncompressed)
- Storage is a problem too: 1 minute = ~300TB (uncompressed)
- With 600x compression, 67Gbps (compressed)
- 1 minute = 500GB (compressed)
Metaverse Working Group