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A Virtual Reality Approach for Minimizing Information Loss in Multi-User, Scalable Environments

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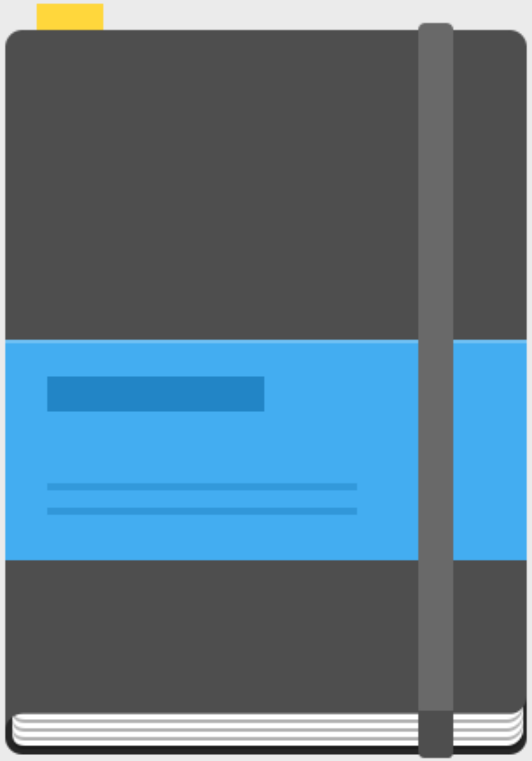
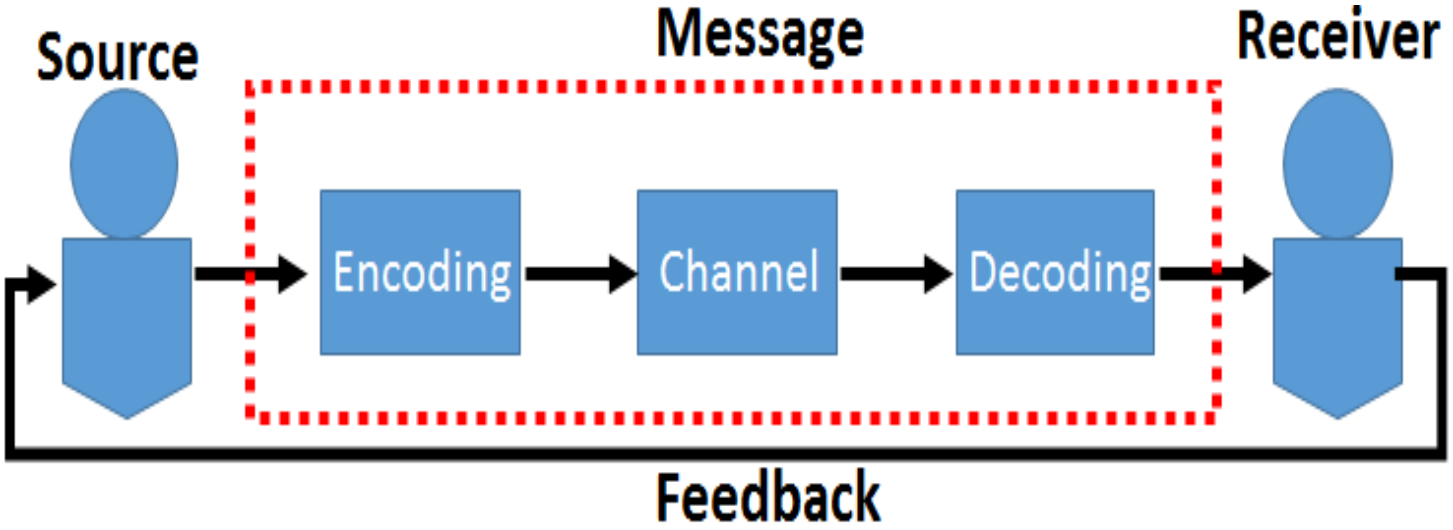
PRESENTATION OVERVIEW



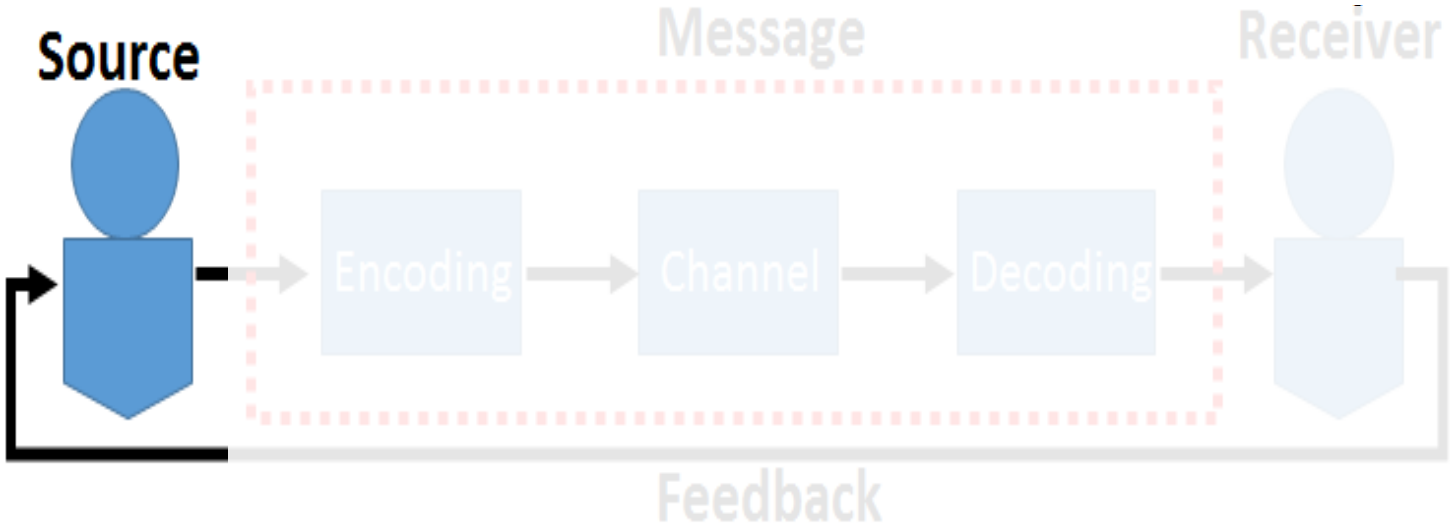
- Background
- Motivation
- Literature
- Methodology
- Case Study
- Results
- Conclusions

Knowledge Dissemination



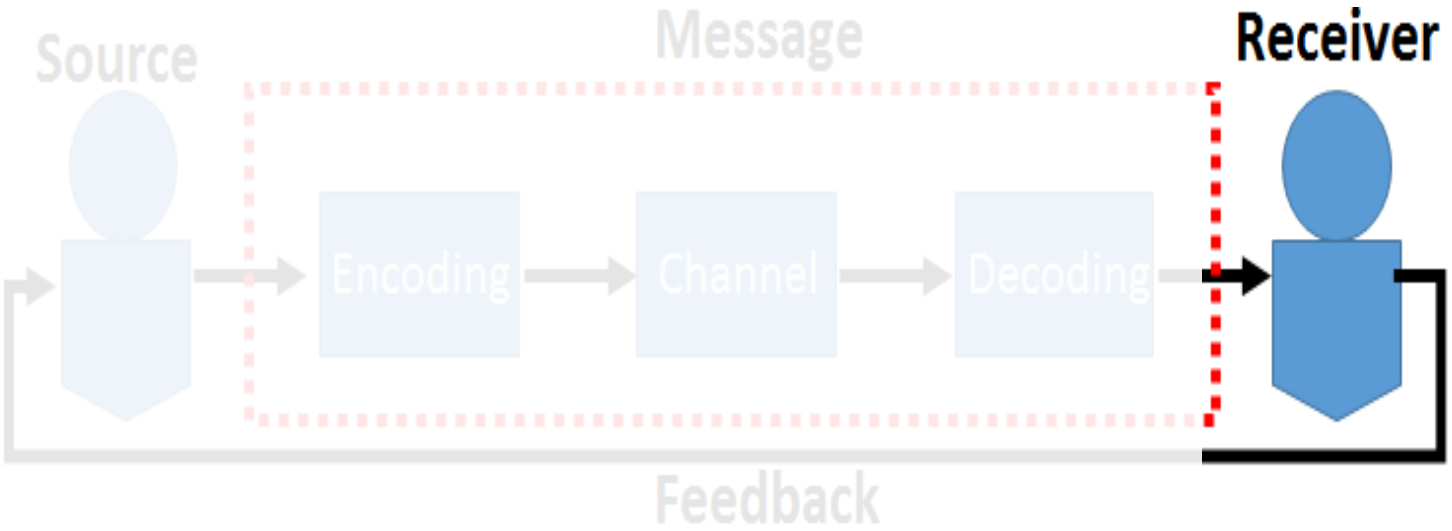
(C. E. Shannon – A Mathematical theory of communication, 2001)

Knowledge Dissemination



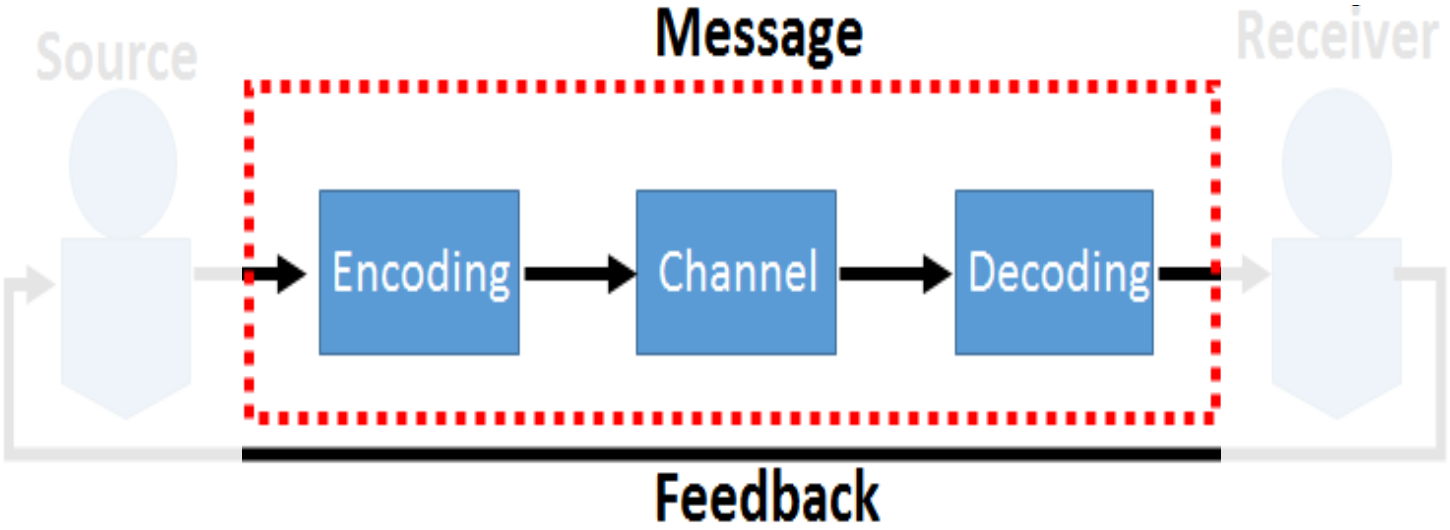
Source= Educators

Knowledge Dissemination



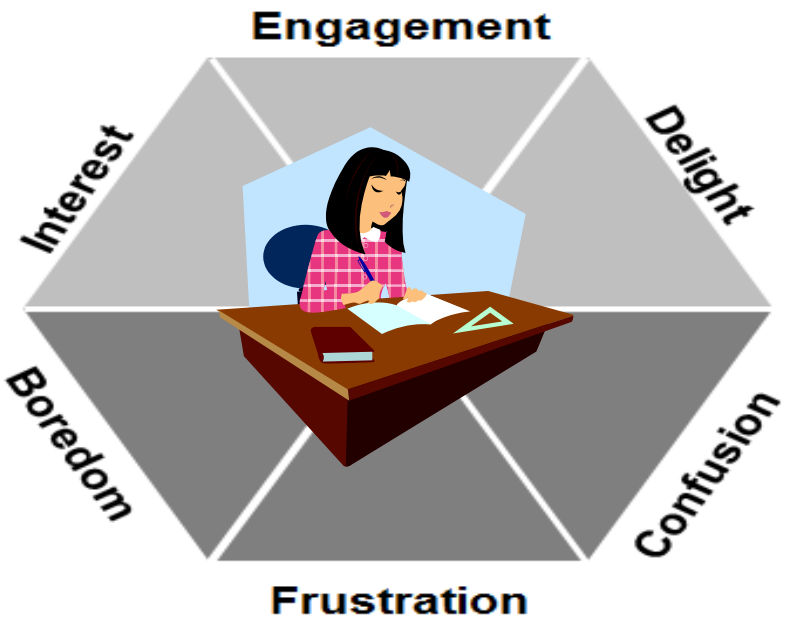
Receivers=Students

Knowledge Dissemination



Variation in the Feedback: Brick and Mortar vs. Virtual Environments

Brick and Mortar Learning

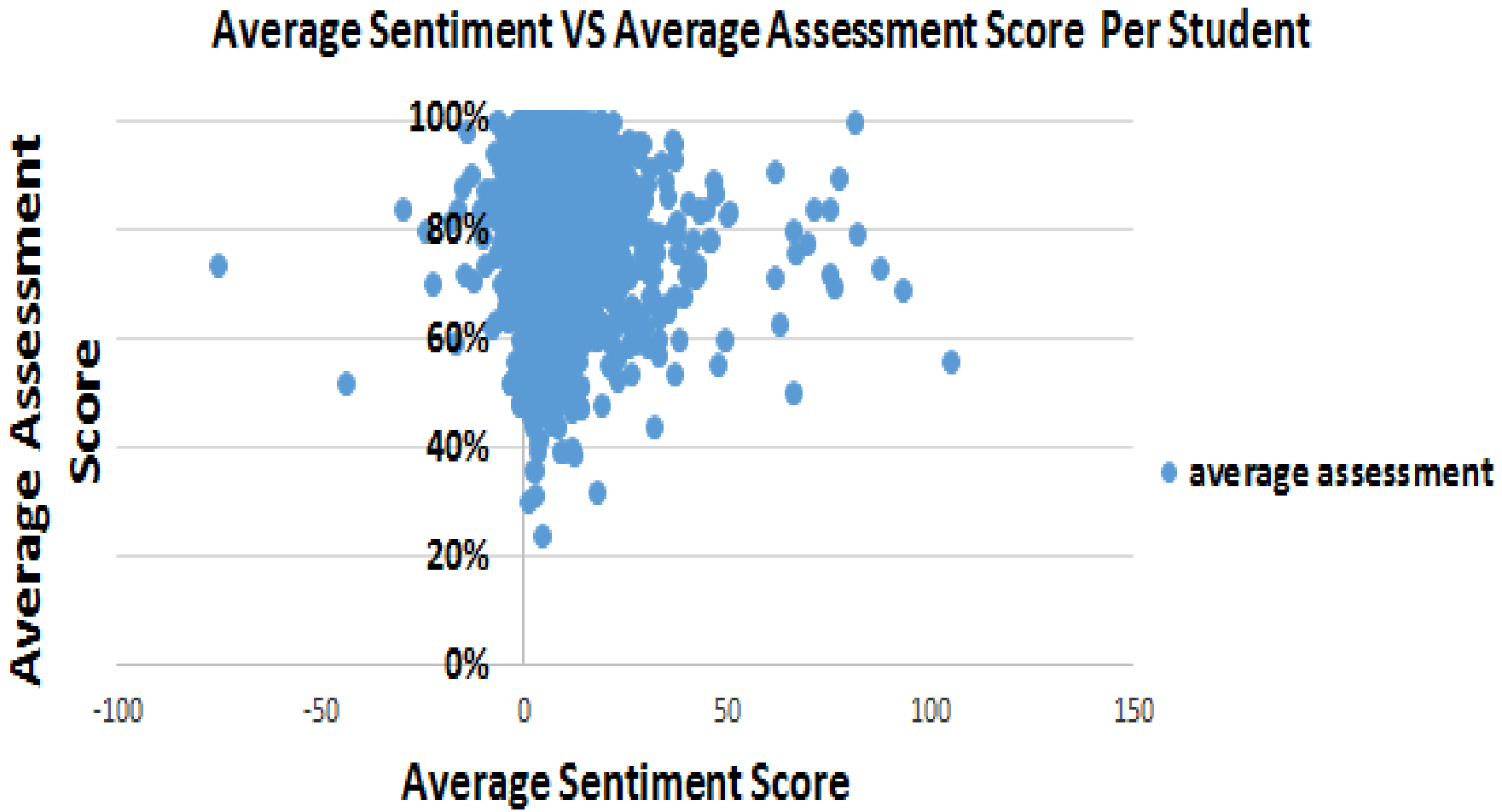


Online Learning

Limitations of Existing Online Approaches

(R. N. Katz, 2010), (C. Steinfield, T. Adelaar, Y. Lai, 2002), (D. L. Bahn, P. P. Fischer, 2003)

Quantifying Receiver's Sentimental Feedback



(Tucker, Dickens, and Divinsky, 2014)

Bridging the Gap Between Brick and Mortar and Virtual Environments

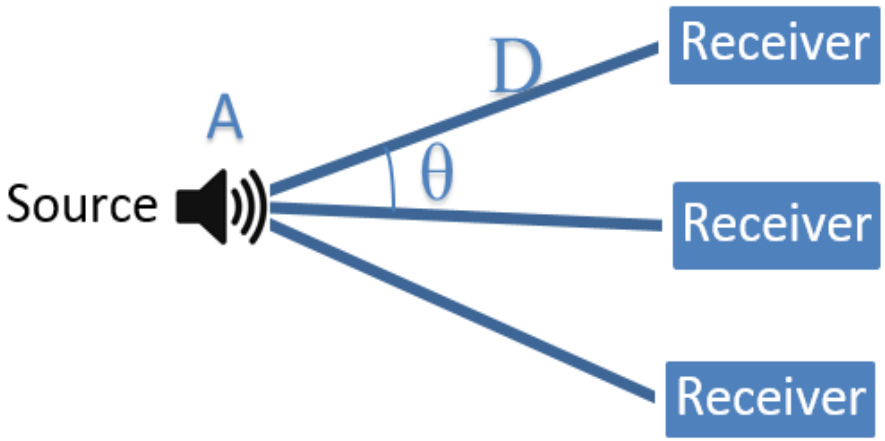
Researchers	Conclusion Drawn
(N. Di Blas, C. Poggi, and T. C. Reeves, 2006)	Previous and concurrent virtual reality environments enhance engagement, attitudes, skills, knowledge, and social relationships for students.
(N. Firth, 2013)	The Oculus Rift with accompanying Unity IDE was the best development platform for which to proceed for virtual reality learning environments.
(G. R. Loftus and E. M. Harley, 2012)	Information dissemination is a common problem across all sensory systems in regards to audial and visual data.
(N. Armstrong and S.-M. Chang, 2007)	Instructors felt a difficulty connecting with students in a large virtual or real world class.

Research Hypothesis

Information Loss in real world learning environments is greater than information loss in VR environments.

v.s.

Variation in the Message Quality in Brick and Mortar Environments



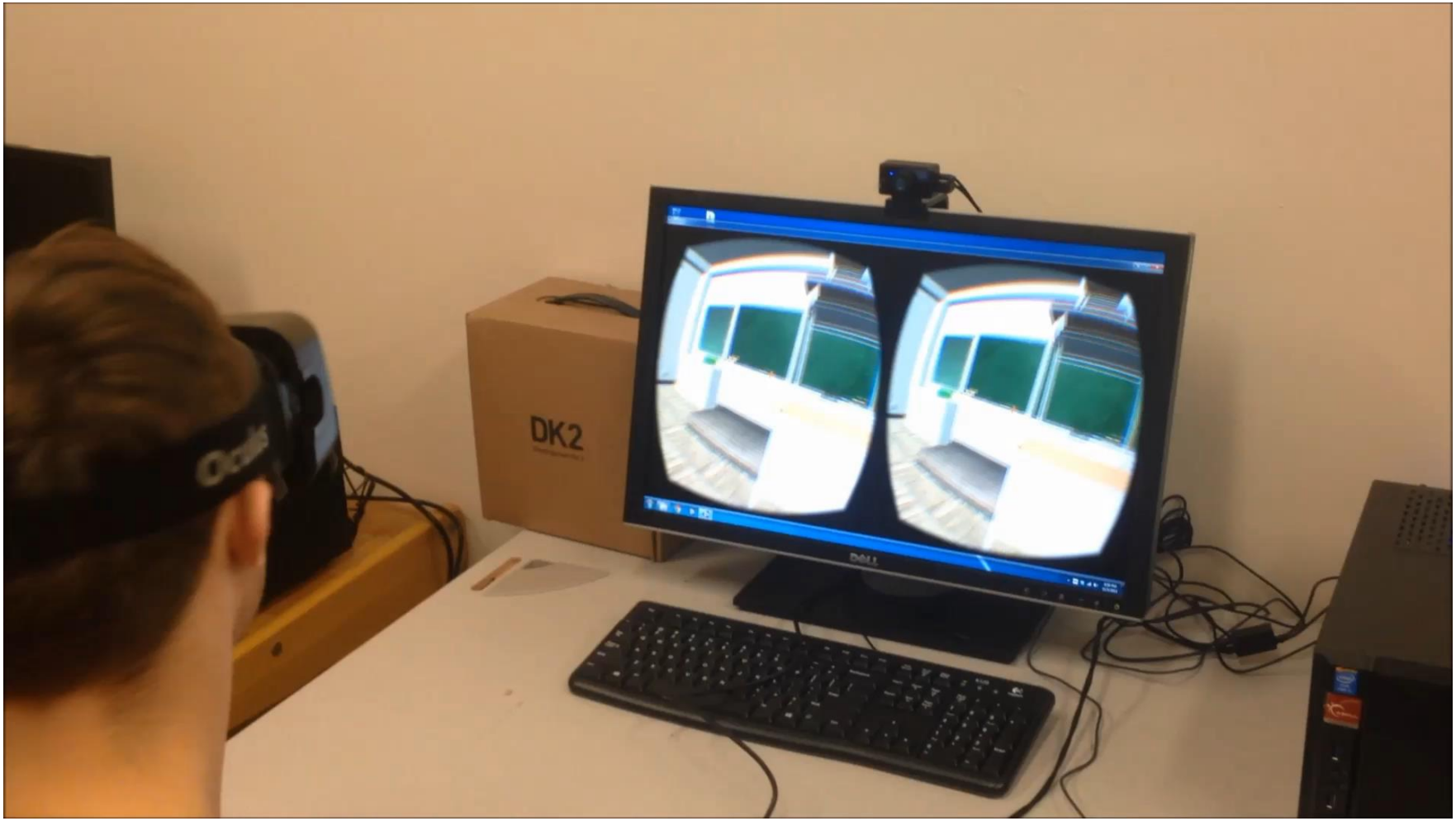
Variable	Channel	Definition	Unit of Measure
D	Visual	Distance from receiver's center and source's center	(x,y)
θ	Visual	Angle from receiver's center and source's center compared to row center	degrees
A	Audio	Audio sample of source output	dB

- F *(D, ϑ, A)* = min (*D* / (cos (*ϑ*) * count *(A))*

Subject to: $D > 0$; $-90° < \vartheta < 90°$; 60 dB < *A* < 70 dB

Proposed Immersive Virtual Environment

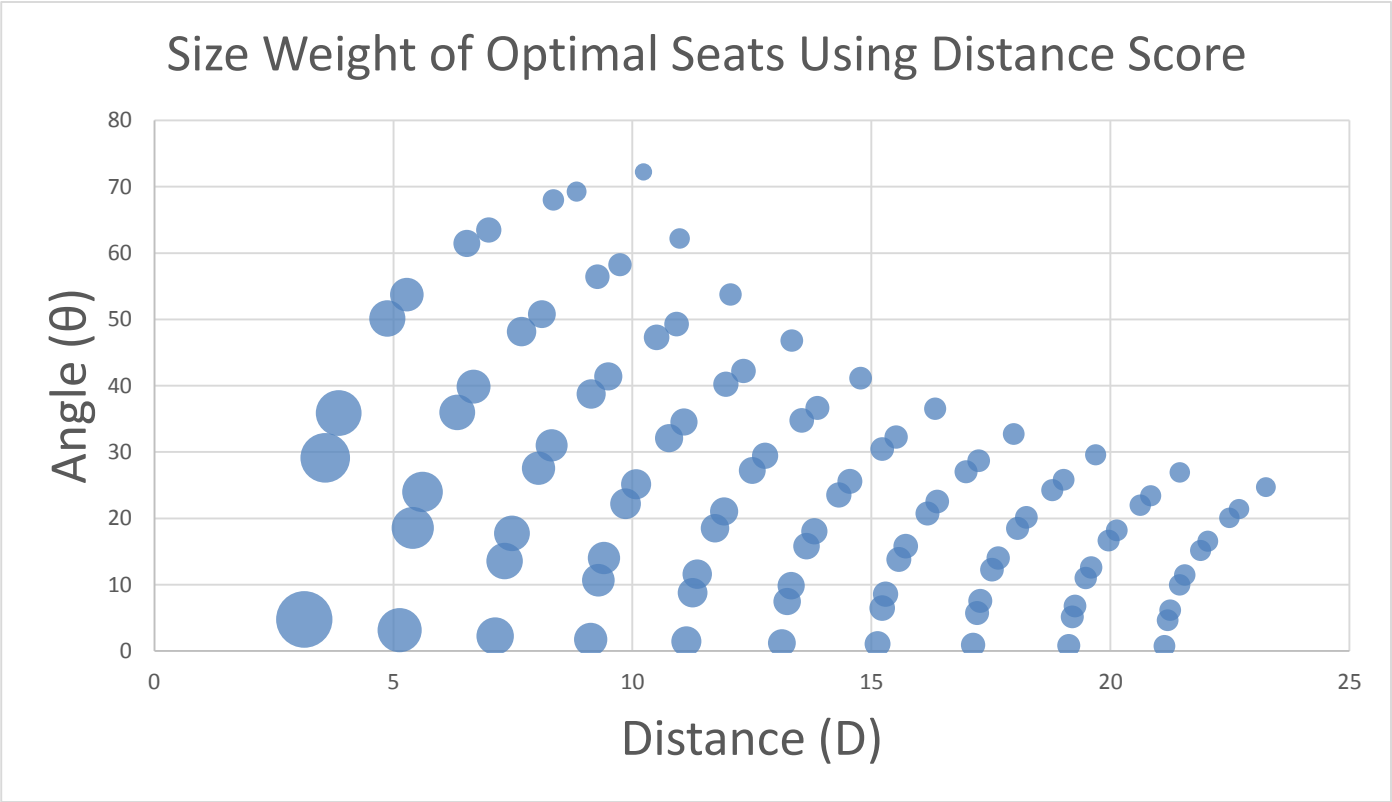
Immersive VR Demo



Environment

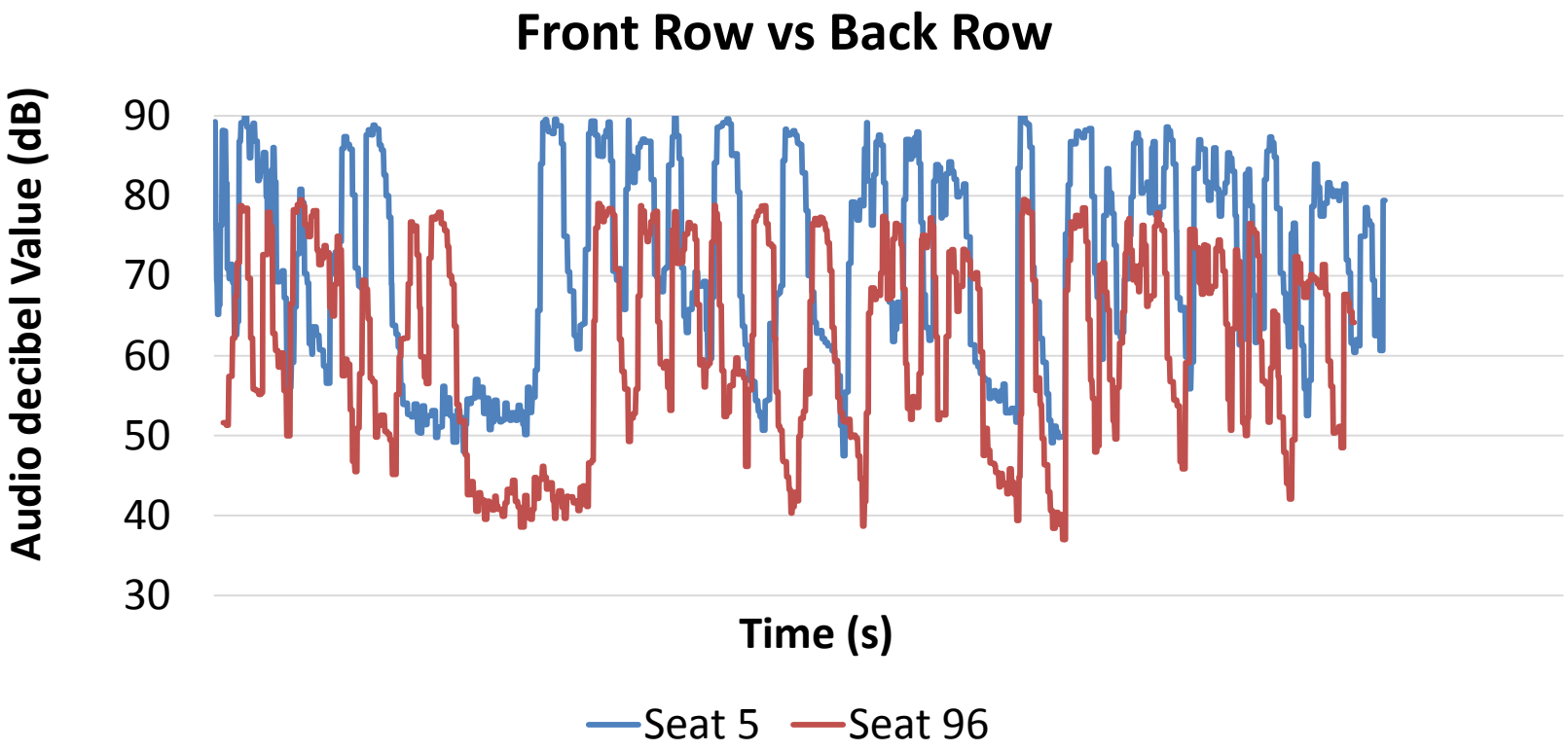
- Built classroom-like room in Unity 3D
- Placed 100 observation objects in place of students as “receivers”
- Simulated Professor at the front of a classroom podium emitting an audio sample of a lecture.
- Various Scripts added to measure telemetry and simulate real-world 3D audio and microphone listening

Visual Data Results



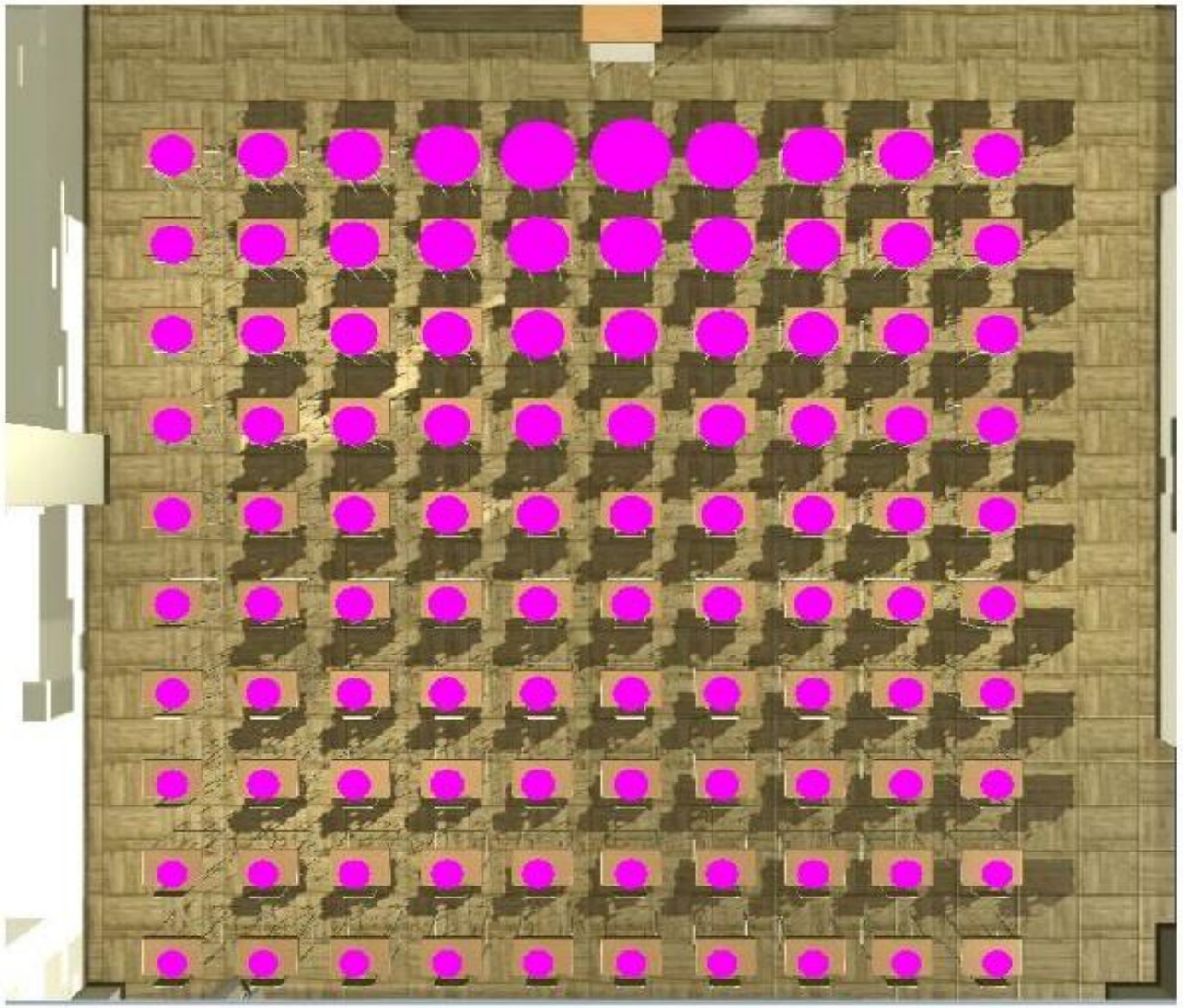
Seat dispersion based on receiver's distance *D*

Audial Data Results

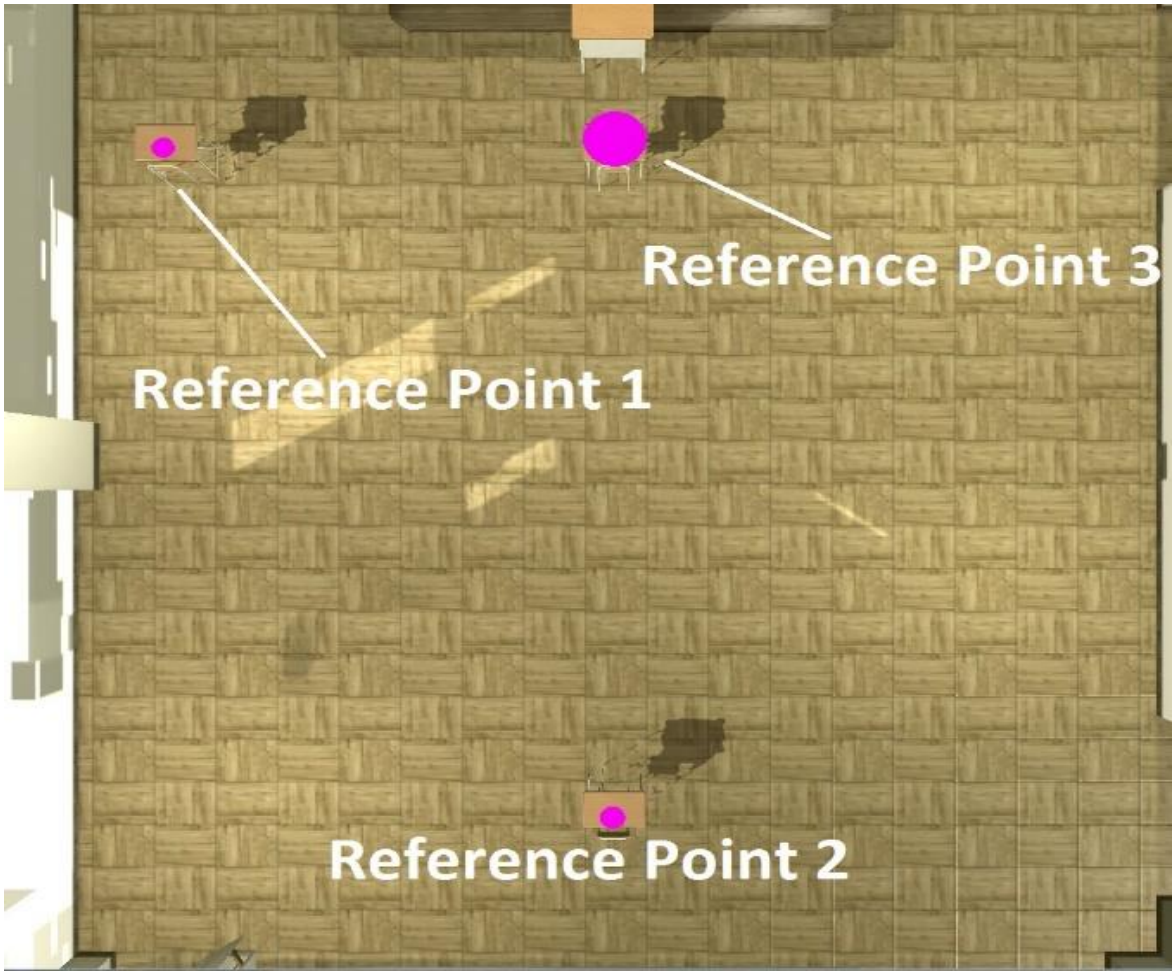


Audial Samples from Front vs Back Row

Complete representation of seat scores for receivers in the brick and mortar learning environment



VR Improvement to the learning environment information loss



Conclusion

- The VR learning environment created starts all receivers at the measured ideal distance from the source, allowing redundancy at the same spot.

- The VR learning environment allows for customization on your location based on your personal preferences

Future Work

- Expanding this Virtual Learning Environment into development for different communication use cases.
- Include additional extensions to VR with a 3D scanner and Emotiv Epoch.