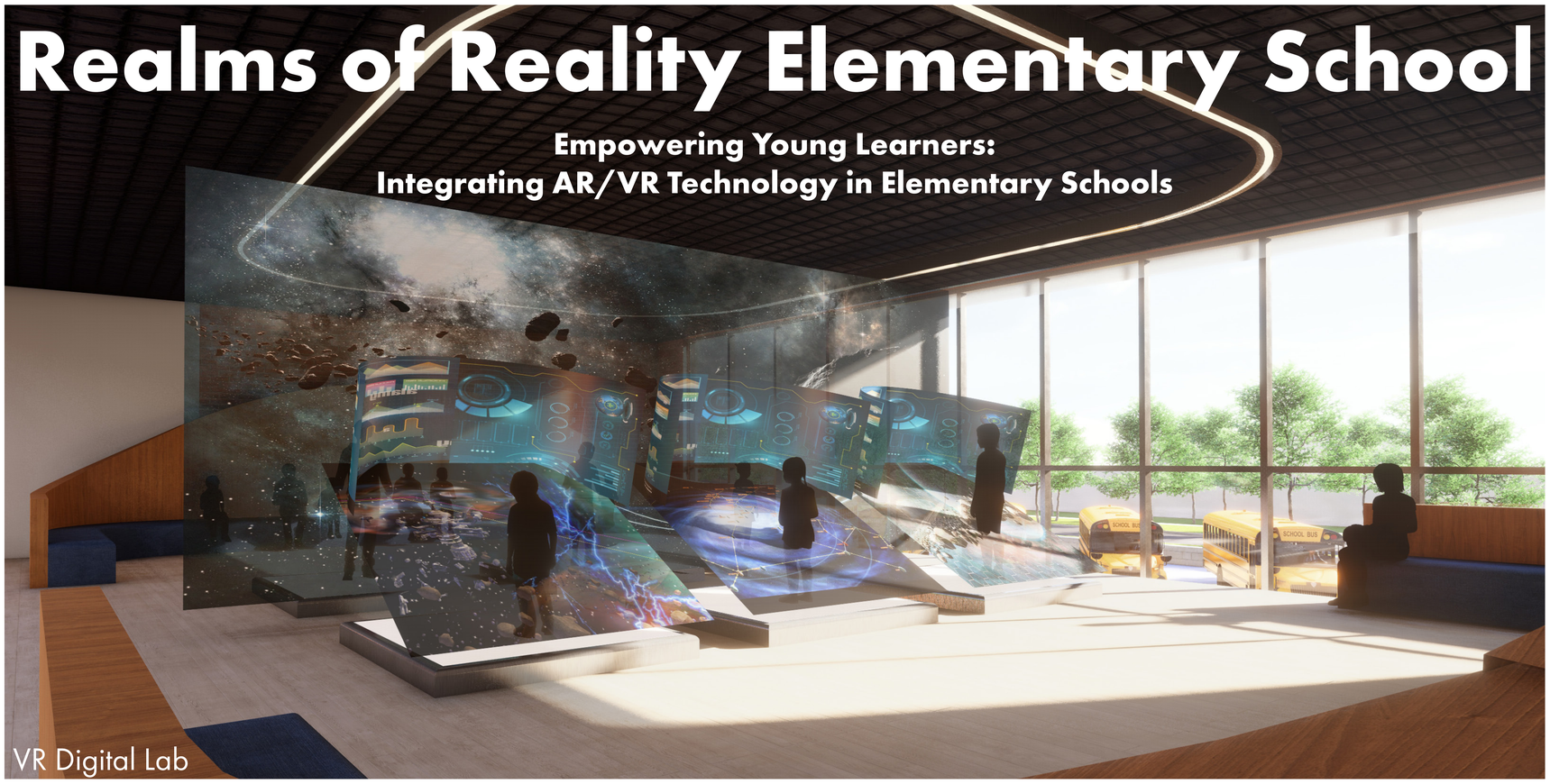
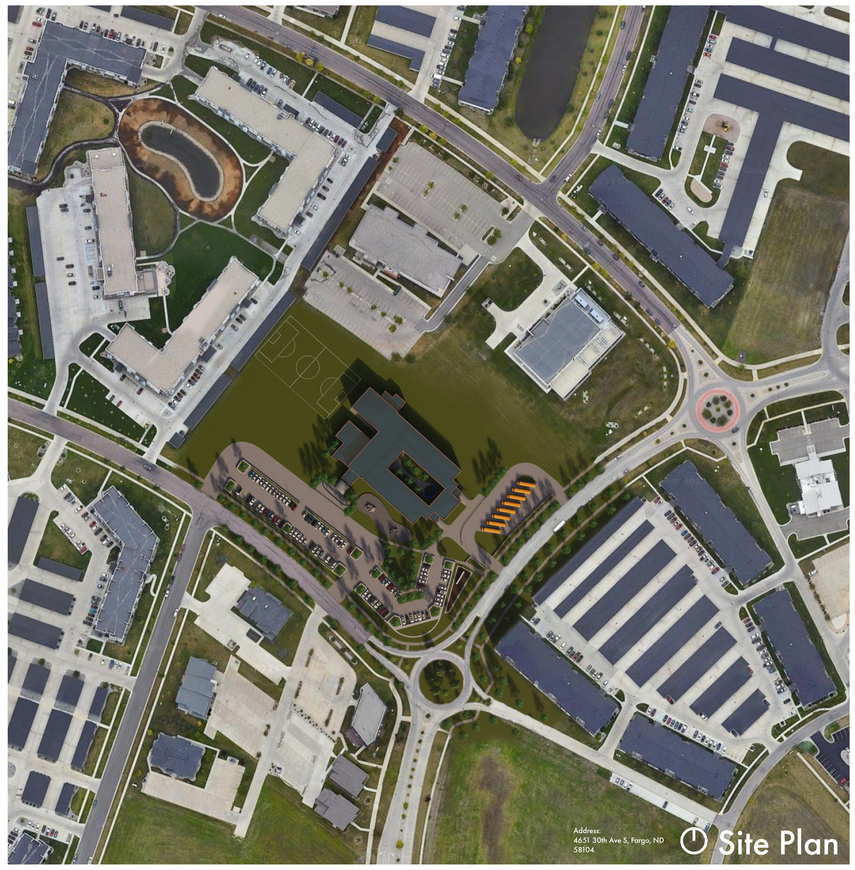
Realms of Reality Elementary School

Empowering Young Learners:
Integrating AR/VR Technology in Elementary Schools



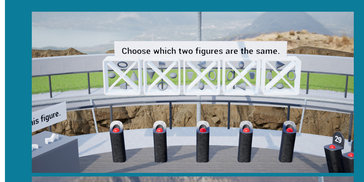
VR Digital Lab

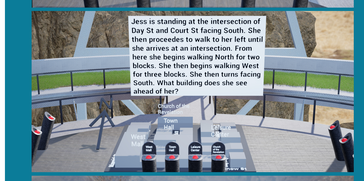


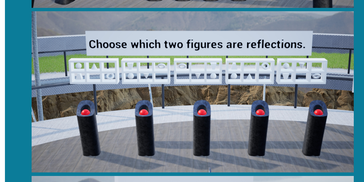
Address:
4651 30th Ave S, Fargo, ND
58104

Site Plan

Spatial Reasoning Ability:
The Strengths and Weaknesses Between Virtual Reality and Paper/Pencil Testing







Question 01: Circle the two identical figures.

Question 02: Which two figures are identical?

Question 03: Identify what building Lisa is in front of on the map.

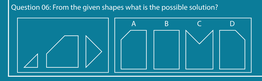
Lisa is standing on Mount Street facing south. She then proceeden to walk to her left until she reaches an intersection. Upon reaching the intersection she begins walking along Oak Park the same way she has been until she reaches another intersection. From here she decided to walk a block south toward South Road. She then proceeden to walk west for three blocks. At the new intersection she begins headling north until she finds the first building to her east. What building is she in front of? _____

Question 04: How many blocks are there?

A.) 62
B.) 64
C.) 68
D.) 70

Question 05: Which two figures are the reflection of one another?

Question 06: From the given shapes what is the possible solution?



This research project explores the relationship between human subjects and data analysis, focusing on spatial thinking tests conducted using different mediums. The study involves administering two tests to participants, with one test taken on traditional paper and the other test taken in a virtual reality (VR) environment. Each test comprises six problems of different spatial ability reasoning types, including group rotation (GR), visual comparison (VC), combining shapes (CS), maps/plans (MP), block counting (BC), and reflection (RF).

The purpose of administering both tests is to determine whether performance differs between the two mediums and to analyze the performance of each question type. Participants complete both tests, with a 5-minute introduction followed by a 10-minute timed test. After a 5-minute intermission, participants take the second 10-minute timed test, resulting in a 30-minute session. Half of the participants started the study by completing the paper test first, while the other half started with the VR test.

The data collected from the tests reveal significant differences between the two mediums. The visual comparison, block counting, and combining shapes questions had higher scores in the paper test, whereas group rotation and reflection questions scored better in the VR test. The map/plans question type produced similar results in both tests. Detailed results are presented below.

While analyzing the results, surveys, and movement, numerous intriguing observations were made, which are elaborated upon in the accompanying research report. The report will be available in the NDSU repository and provides a detailed explanation of these findings over the summer.

Paper Test							VR Test						
GR	VC	MP	BC	RF	CS		GR	VC	MP	BC	RF	CS	
1	1	1	0	0	1		1	0	1	0	0	0	
1	1	1	0	1	1		1	1	0	0	1	0	
0	1	0	1	0	1		0	1	0	1	0	0	
1	1	0	1	1	1		1	0	1	0	1	0	
1	1	1	1	1	1		1	1	1	0	1	0	
1	1	0	0	1	0		1	1	0	0	1	0	
1	1	1	1	1	1		1	1	1	0	1	0	
0	1	1	0	0	1		1	1	1	0	1	1	
1	1	0	1	1	1		1	1	0	0	1	0	
7	9	5	5	6	8		8	7	5	1	7	1	

VR Simulation Lab

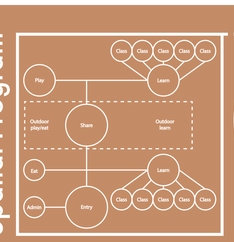
AR Entrance

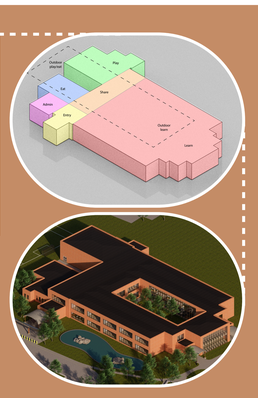
AR Learning Hall

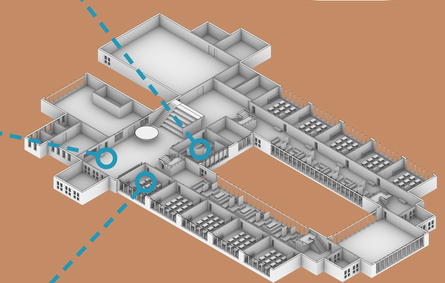
AR Classroom

AR Learning Hall

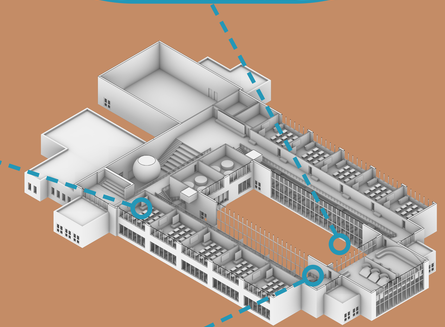
Spatial Program







Courtyard



Narrative

Integrating Augmented Reality (AR) and Virtual Reality (VR) technologies into the K-12 educational model has the potential to redefine the success of the next generation of minds. Although schools have been slowly incorporating newer technologies to aid students, they have not yet implemented AR and VR. This thesis aims to design a new K-12 facility that incorporates AR and VR technologies to improve academic efficiency among students.

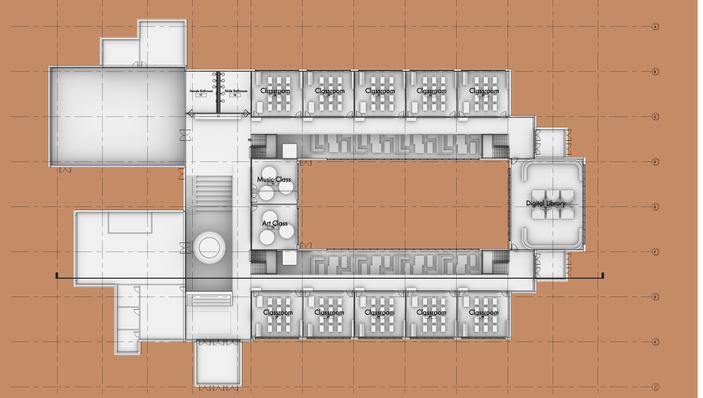
In today's technological era, schools are incorporating various digital tools such as SmartBoards, Projectors, Chromebooks, and E-books to enhance the quality of education. The use of these technologies has the potential to revolutionize classroom design, augment the existing curriculum, foster collaboration, increase students' knowledge of technology, and bring numerous other benefits.

Moreover, the advent of VR and AR technologies has opened up new possibilities for innovation in various industries and professions. It is essential to consider integrating these cutting-edge technologies into the education system to equip future generations with the necessary knowledge and skills that will help them contribute positively to society.

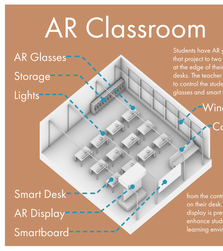
Implementing AR and VR technologies in education aligns with the top seven principles for using technology in education, including active engagement with learning material, use of real-world issues, simulation and modeling, online discussion and debate, group work, coaching, and formative assessment. These principles foster critical thinking, problem-solving, and group dynamics in the classroom. AR and VR can enhance spatial reasoning abilities through immersive and interactive experiences, spatial mapping, visualization, and realistic simulations of real-world scenarios.

Level 01 Floor Plan

Level 02 Floor Plan

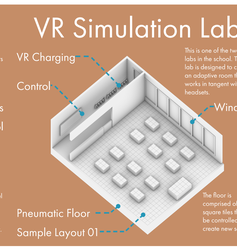


AR Classroom



Students have AR glasses that project to two monitors at the edge of their smart desks. The teacher is able to control the students' glasses and smart table from the control panel on their desk. An AR display is present to enhance students' learning environment.

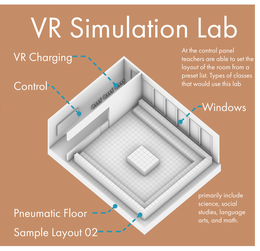
VR Simulation Lab



This is one of the two VR labs in the school. This lab is designed to create an adaptive room that works in tangent with VR headsets.

The floor is comprised of 1'x1' square tiles that can be controlled to create new settings.

VR Simulation Lab



At the control panel teachers are able to set the layout of the room from a preset list. Types of classes that would use this lab primarily include science, social studies, language arts, and math.

Section Cut