



XR-FLC

Course Redesign with XR

Pilot Report

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Course Information

Course NO. & Name	NSCI 1A Integrated Physical Science (05-36646)
Course Description	Integrated Physical Science – Basic concepts and misconceptions in physical science and their relation to the everyday environment. Memorable demonstrations in lecture, household-related experiments, and experiments of special interest to K-6 teachers. Meets G.E. B1 requirement only for liberal studies majors.
Significance to Major	Required.
Course Prerequisite(s)	MATH 10A with a grade of C or higher
Course Level	Lower division GE
Course Enrollment	42 (Spring 2023)
Course DFW Rates	Fall 2022 - 14% (20/143) Spring 2022 - 13% (18/135)



Redesign Specifications

Scope of the Redesign	I replaced a discussion board homework activity with a VR activity. Students went to the engineering building on campus to complete the activity.
XR Technology Selected	Virtual Reality
XR Devices Selected	Oculus Headsets
XR Application(s) Selected	FutuClass
Total Course Redesign Time	10 hours



Active Learning with XR

Learning Activity Description	To improve understanding of element and compound names, atomic structure, and the balancing of chemical equations.
Learning Objective(s)	<ul style="list-style-type: none">-Name elements and compounds correctly.-Identify the number of subatomic particles in an element (protons, electrons, neutrons)-Balance chemical equations correctly.
Specific Active Learning Pedagogy	Students completed the activity in groups of 2-3 using sign ups for the engineering space.
Activity Logistics	Students reached out to the research assistant to book a time to complete the VR activity (1 session).
Activity Duration	20-40 minutes depending on the students.
Availability of TA?	No.
Availability of Tech Support?	Yes, research assistant.
Total Instructional Time Committed	Zero because it was a homework exercise.



Learning Assessment

Direct Assessment	Individual Pre/Post Assessment
Formative	None
Summative	Pre/Post Assessment
Indirect Assessment	Reflection from students Interview with research assistant Observation by research assistant
Formative	Observation by research assistant
Summative	Reflection from students Interview with research assistant



Pedagogical Impacts of XR

- Directly contribute to the project research questions
 - How students learn differently with XR-enhanced active learning
 - I did not have enough students this semester to conduct a comparison study (28 participants). I conducted a pilot design study to evaluate my pre/post assessment, reflection prompts, and interview questions. The pre/post assessment showed significant pre/post improvement with increases across all 12 items after conducting the VR activity. The pre to post average went from 6.5 (SD=3.04) to 8.7 (SD = 2.44; M =2.2 (SD = 2.63), $p = 0.001$, Effect size (Hedge's $g = 0.78$ (Medium effect size)
 - How different students learn with XR-enhanced active learning
 - Examine student performance with intersectionality
 - Gender, ethnicity, first-generation status, social-economic status
I am unable to pull this data at the moment, but I also do not think I have enough data to draw reliable inferences based on these student characteristics. I can provide student IDs if OIE can pull this data.
- Pre/Post Raw data is available here ([Link](#))
- Student Reflections Raw Data is available here ([Link](#))
- Transcript with Research Assistant ([Link](#))