TEACHING & LEARNING WITH VIRTUAL REALITY

VICTORYXR

SPRING 2024

bâton | global

EXECUTIVE SUMMARY

In 2023, VictoryXR engaged Bâton Global, a consulting firm providing custom research services, to conduct research to develop a more robust understanding of virtual reality (VR) as it pertains to teaching and learning in higher education, with a specific focus on universities using VictoryXR's products and platforms. In particular, the research sought to illuminate how these technologies empower instructors as they design and deliver effective learning experiences over the length of a course, and how well the technologies deliver immersive student experiences that learners desire and feel support their learning.

Twenty-four (24) professors representing 19 universities participated in the Fall 2023 research study, which combined qualitative and quantitative methods. Professors initially submitted Research Intake Forms in which they provided contextualizing information on their respective courses (area of study, estimated class size, planned uses of VR, etc.). Throughout the semester, professors were asked to submit Learning Event Surveys after each use of VR in their classrooms to report brief details of the teaching application and their perspectives regarding the VR-enabled teaching experience. At the end of the semester, professors were invited to submit final reflections on their use of VR, and students were invited to participate in a Student Learning Survey in which they shared their perspectives on the immersiveness of the VR experience, as well as on the effectiveness and desirability of learning using VR. Over 150 students responded to the student survey. Key findings included:

- Instructors found VR use highly successful (96%) and effective (98%), and 100% plan to use VR to teach the same content again in the future.
- All professors believed the use of VR had a positive impact on their students' learning and that the use of VR enabled learning experiences or outcomes that would otherwise have been unattainable.
- All professors' expectations for teaching with VR were met, with 40% saying their expectations were exceeded.
- Eighty-nine percent (89%) of students agreed that VR enriched their learning experience, and 78% agreed that VR had a positive impact on their learning outcomes.
- Sixty-two percent (62%) of students wished the course had used more VR and 71% indicated they would consider registering for more courses using VR in the future.
- Those students whose professors used VR five to ten times during the semester indicated higher agreement that VR enriched their learning experience (95%) and that the use of VR had a positive impact on their learning (89%), as compared to their peers whose professors used VR only two to four times during the semester (81% and 60%, respectively). Overall, both groups responded positively to VR.

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PROJECT OBJECTIVES

The goal of this research was to develop a robust understanding of virtual reality learning and its role as it pertains to higher education. The following objectives for the project are shared below:

1. Conduct research to inform success metrics of VictoryXR and the implementation of immersive learning using virtual reality
2. Gain a deeper understanding of immersive learning, educational best practices, and successful implementation as defined by stakeholders
3. Map feedback and data obtained throughout the process to inform future implementation of metaverse learning and metrics for measuring success
4. Inform decisions about pursuing expansion of immersive VR learning in higher education.

RESEARCH DESIGN

PILOT PROGRAM: SPRING 2023

Overview

In Spring 2023, a pilot program was conducted to assess the effectiveness of virtual reality (VR) in enhancing learning outcomes across three participating universities, and to establish a reliable methodology for a larger study to be conducted in the fall. The program primarily adopted a qualitative approach due to the diverse range of classes involved, including courses in sociology, astronomy, and chemistry.

Key Findings

The pilot study provided valuable insights into the instructional design and delivery methods employed by instructors using VR technology. Evaluations of success primarily focused on instructors' perceptions of VR's utility in achieving their teaching objectives and facilitating student learning. However, directly comparing traditional teaching methods with VR-based instruction proved challenging due to the varied approaches and contexts within each class, coupled with the low sample size.

Implications for Fall 2023 Research Design

The Spring 2023 pilot program informed the design of the research framework for the investigation featured in this report. By incorporating a more expansive sample size and refining data collection methods, the Fall Research Study 2023 aimed to provide more

robust insights into the impact of VR on teaching and learning outcomes in higher education settings by using replicable, quantitative means.

FALL 2023

Methodology

Following the pilot program, the research methodology was refined for future investigations. The revised approach emphasized broader participation to gather a more comprehensive dataset, using close-item tools more prevalently to answer the following research questions.

Research Questions

- How does teaching with VR influence and support pedagogical choices?
- How do learning outcomes of VR-enabled experiences compare to those of similar experiences in online and/or traditional course formats?
- How do instructors' perceptions and expectations at the beginning of the semester compare with their perceptions and plans at the end of the semester?

Instructor Stakeholder Insights

The tools used with instructors focused on eliciting insights in four main areas:

- **Course Information**: Course content, frequency of teaching (ex, per semester, per year, etc.), number of students, level (graduate, undergraduate, major/non-major)
- **Background and Motivation**: Instructor experience with VR, motivation to join pilot, expectations of outcomes
- **Pedagogical Choices Concerning VR**: Frequency of use over course, criteria for inclusion and lesson design, content/knowledge areas supported (declarative, procedural, analytical, etc), evaluation of learning and effectiveness
- **Perceived Teaching Effectiveness:** Perceived success and impact on learning outcomes, learner engagement, comparison to traditional methods, intention to use again

Student Stakeholder Insights

The tools used to gain insights from students were centered around three main areas:

- **Student Experience:** Immersion, engagement, affect
- **Student Background and VR Familiarity**: Demographic contextualization, use of VR outside of learning, previous VR experience in academia

- **Student Perspectives on VR in Learning**: Evaluation of learning and effectiveness, desire for VR for learning, engagement, benefits and potential detractors

Data Collection Approach

The Summer of 2023 marked the beginning of data collection efforts, initiated through informational sessions organized by Bâton Global for professors and university liaisons. These sessions provided an introduction to the study's objectives and methodologies, with several sessions recorded for wider dissemination.

Following the informational sessions, an intake form was distributed to professors identified by Victory XR (see Appendix A). The intake form solicited basic contact information and outlined the study's requirements, including periodic learning event surveys, a post-semester questionnaire, and student surveys towards the end of the semester. Participation outreach extended through October in an effort to maximize participation rates.

Participating professors were reminded to submit learning event surveys after each time they used VR in their class over the course of the semester (Appendix B). Professors also submitted a post-semester questionnaire or responded to an asynchronous interview, reflecting on their experiences and offering feedback on VR's alignment with their expectations (Appendix C).

Research Design: Instructor Perspectives	
Research Question	**Method and Tools**
How does teaching with VR influence and support pedagogical choices?	Quantitative/Close: • Learning Event Surveys Qualitative/Open: • Learning Event Surveys • Interviews
How do learning outcomes of VR-enabled experiences compare to those of similar experiences in online and/or traditional course formats?	Quantitative/Close: • Learning Event Surveys Qualitative/Open: • Interviews
How do instructors' perceptions and expectations at the beginning of the semester compare with their perceptions and plans at the end of the semester?	Quantitative/Close: • Intake Form • Post-Semester Instructor Survey

In addition to gathering instructor insights, the study also sought input from students toward the end of the semester through a dedicated survey administered at the semester's conclusion (Appendix D). Adapting the Game Experience Questionnaire (Ijsselstein et al, 2013), students were asked to evaluate their immersion, engagement, challenge, success, and overall satisfaction with the VR-enhanced learning experiences. Open-ended questions supplemented these quantitative measures, allowing for qualitative feedback on the perceived effectiveness of VR in supporting their learning objectives.

By systematically capturing the perspectives of both instructors and students, this study aimed to inform evidence-based strategies for optimizing VR-enhanced learning environments. The figure below demonstrates the application and sequencing of the research design through the fall of 2023.

July 2023	August	September	October	November	December	January 2024
Information Sessions	Research Intake Forms (Professor Submissions) and Participant Outreach				Post-Semester Questionnaire (Professor Submissions)	
	Learning Event Surveys (Professor Submissions)					
				Student Perspectives Survey (Student Submissions)		
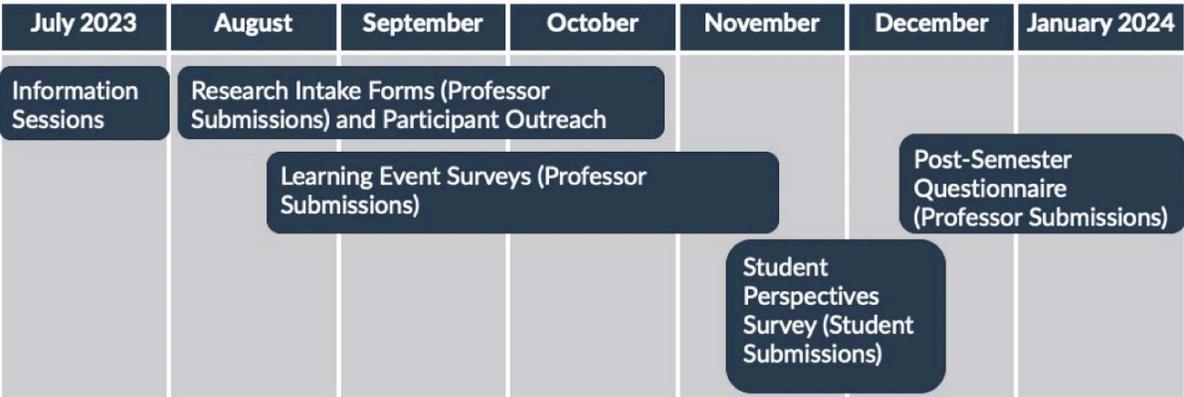
RESEARCH FINDINGS & ANALYSIS

INSTRUCTOR INSIGHTS: COURSE AND BACKGROUND INFORMATION VIA THE RESEARCH FORM

Professors at partner institutions were invited to opt-in to research participation through a Research Intake Form, providing a platform for valuable insights to be gathered and analyzed.

University and Instructor Participants

- Twenty-five percent of VictoryXR's university partners participated in the study.
- Twenty-four (24) individual professors representing 19 distinct universities completed the intake form and provided information regarding their class makeup, content matter, and projected use of VR over the semester.

- Approximately 565 students were represented across the 25 courses registered for research participation, with an average of 23.6 students represented per course (range of 2 to 120 students).
- Eighty-four percent (84%) of courses registered to participate were undergraduate courses, with the remaining 16% being graduate courses.
- An additional three universities contributed data and insights to this research study through alternative methods.

Course Subjects Represented in Data

During the research term, participating instructors utilized VR to teach a variety of subjects. Many of the courses that were registered were business-related subjects followed by natural sciences (chemistry, biology, geology, etc.).

Course Subject Matter

Subject	Count
General Studies	1
Humanities	3
Social Sciences	3
Natural Sciences	6
Business	8
Computer Science	1
Education	2
Law	1
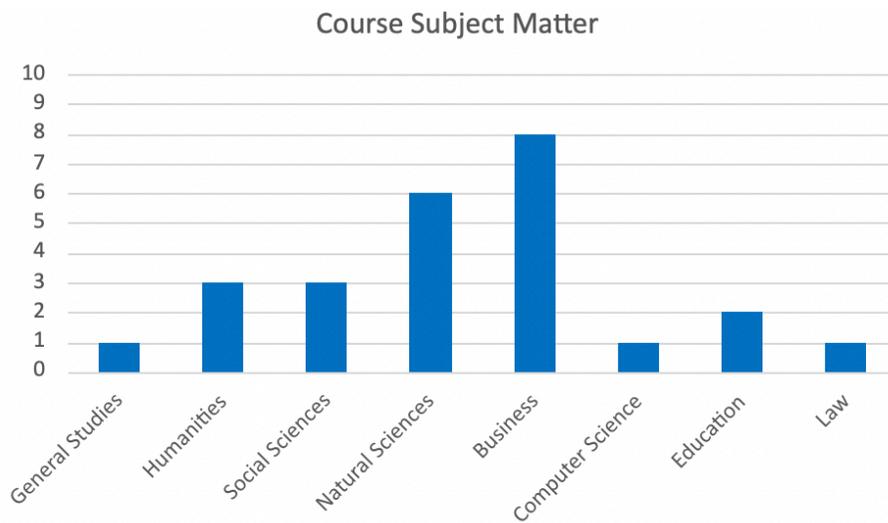
Class Size Distribution

The initial intake forms revealed that 37% of classes were composed of 10-20 students, while a substantial 33% had class sizes ranging from 21 to 40 students. This distribution underscores a notable portion of classes falling within the medium to moderate size range.

Class Sizes
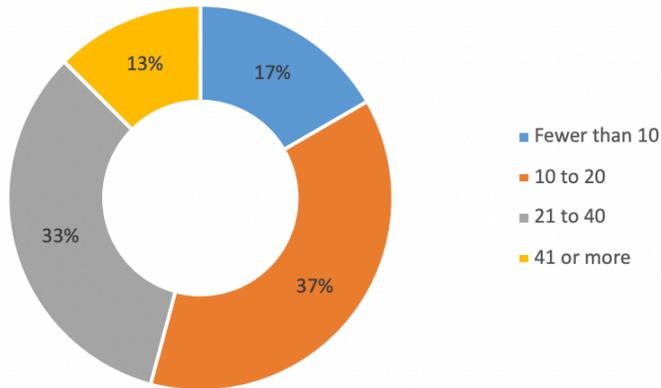
Projected Frequency of Use Over Semester

The initial intake forms revealed that 36% of professors intended to integrate Virtual Reality (VR) into their teaching methodology two to four times during the semester while 33% of the surveyed professors planned to incorporate VR more frequently, aiming to use the technology five to ten times. This distribution highlights a considerable interest among educators in leveraging VR technology as a regular component of their teaching strategies.

Projected Frequency of Use
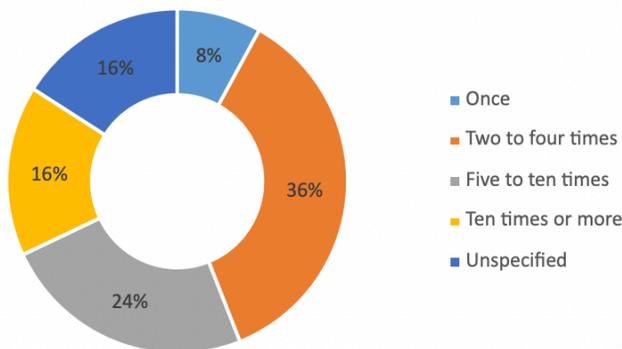
Instructor Participants

- Twenty-two percent (22%) of participating instructors reported having previously used VR to teach the same course.
- Fifty-six percent (56%) of participating instructors also indicated that they use VR outside of the classroom, in their personal lives.

How Professors Intended to Use VR

In the intake form, professors outlined their plans for integrating VR into their courses. After reviewing these responses, several themes emerged, which were then organized and analyzed for frequency. The identified themes and their corresponding frequency of mention across participants are summarized as follows:

FIELD TRIPS
33% planned to facilitate virtual trips through time or space.

HOSTING LECTURES
33% planned to use VR as a meeting space for students to host speakers or lectures, some as an alternative to Teams or Zoom.

DEVELOPMENT & CREATION
25% planned to have students create environments, assets, or art.

ROLE PLAY
12% planned to have students role play to reinforce interactional skills.

LABORATORIES
8% planned to host laboratories (science) in the VR environment.

DATA VISUALIZATION
12% planned to have students create interactive data visualizations.

How Professors Defined Success with VR

In the intake form, Professors defined their success with using VR in their course. After reviewing these responses, several themes emerged, which were then organized and analyzed for frequency. The identified themes are summarized as follows:

IMPROVED LEARNING
While definitions of improvement varied, 46% of professors wanted to see learning outcomes improved through VR.

POSITIVE LX
42% said VR for teaching is successful if students and instructors have a smooth experience free of technical obstacles.

CREATE IN VR
21% of professors said students' ability to create and work in VR would be an indicator of learning success.

STUDENT PERCEPTION
17% indicated they would use student perception of VR's benefit and utility as a measure of success.

INSTRUCTOR INSIGHTS: LEARNING EVENT SURVEYS

Learning Event Surveys were used to gather instructor insights on discreet implementations of VR in teaching and learning over the course of the semester.

Instructors were asked to submit a Learning Event Survey after each use of VR during the research term.

Survey questions included:

- Which content or knowledge areas did you intend to support with the use of VR in this learning event?
- Rating of agreement with statements: The use of VR in this learning event was successful, Learners were engaged, Students learned what was intended, and I will consider using VR again to teach this material in the future.
- Open-ended option for providing additional, free-form insights

Instructor Insights: Response Volume

- Forty-one learning events (unique applications of VR in a class session or activity) are represented in the data, accounting for implementation insights from 15 professors.
- Overall, more than 350 students' learning experiences were represented in the Learning Event Survey data provided by the professors submitting Learning Event Surveys.

Instructor Perspectives

All instructors agreed that learners were engaged while using VR, and that they would use VR again to teach the same content.

Learning Events: Instructor Perspectives
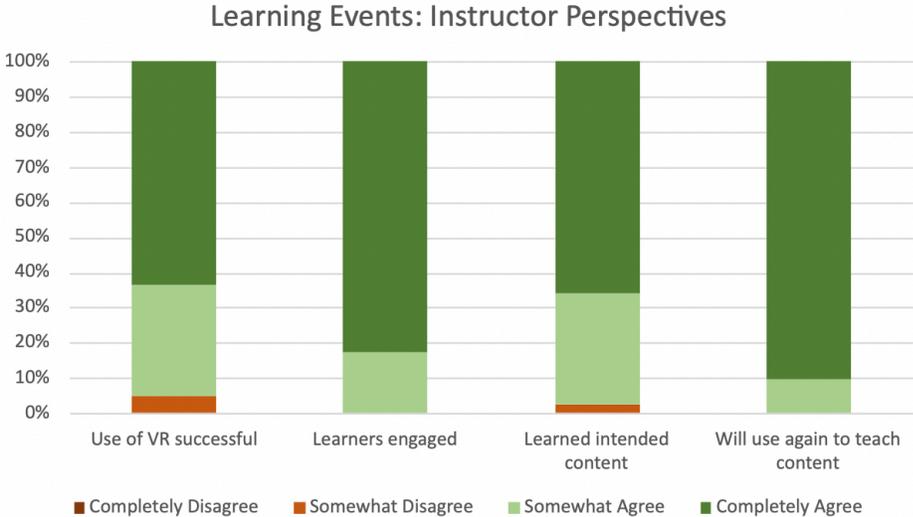
STUDENT INSIGHTS: END-OF-SEMESTER SURVEYS

Student surveys were issued in the final weeks of the research semester to gather learner insights on the use of VR over the course of the term. Survey questions included:

- Student background and contextualizing items (gender, VR exposure and use, age, etc.)
- Student Experience: Ratings of the VR experience (immersiveness, presence)
- Student Learning: Likert-type items rating agreement with statements regarding VR's utility to learning, desirability, etc.
- An open-ended space for free-form insights

Student Participants

- Approximately 500 students were invited to participate through their professors.
- Ultimately, an impressive 157 student responses were collected.
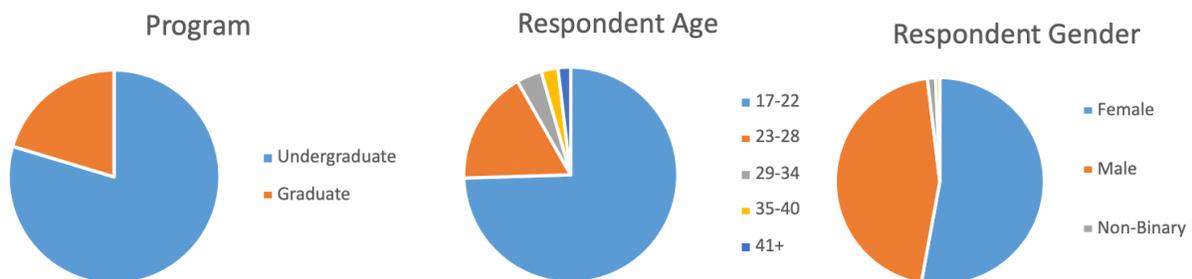
Survey Responses: Frequency of VR Use Outside of Academia

- Students between the ages of 17 and 28 (92% of respondents) reported more frequent use of VR for non-academic purposes, with some students (14%) reporting using VR outside of the classroom at least weekly.
- The few student respondents (n=3, <2% of participants) age 41 years or older indicated no use of VR outside of classroom applications.

Non-Academic Use Frequency by Age
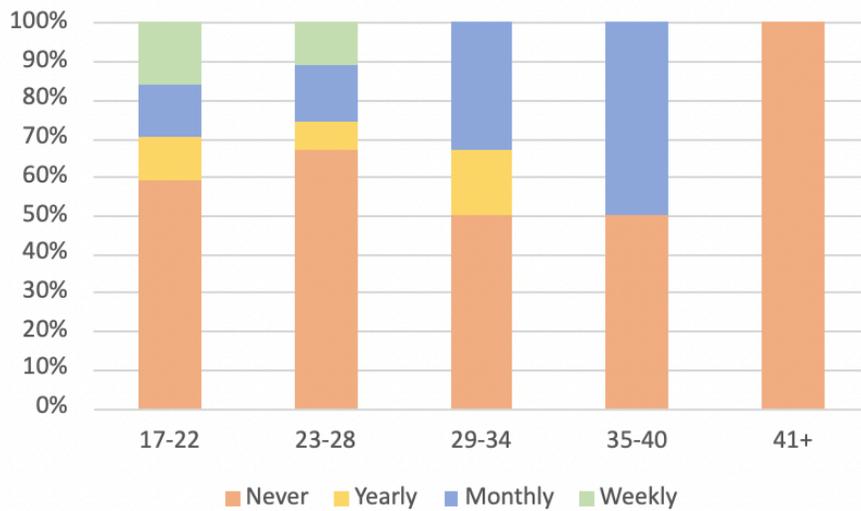
Survey Responses: Student Experience

From the student perspective, the VR experiences were largely positive:

Ratings of Engagement and Satisfaction while using VR during class assignments or activities
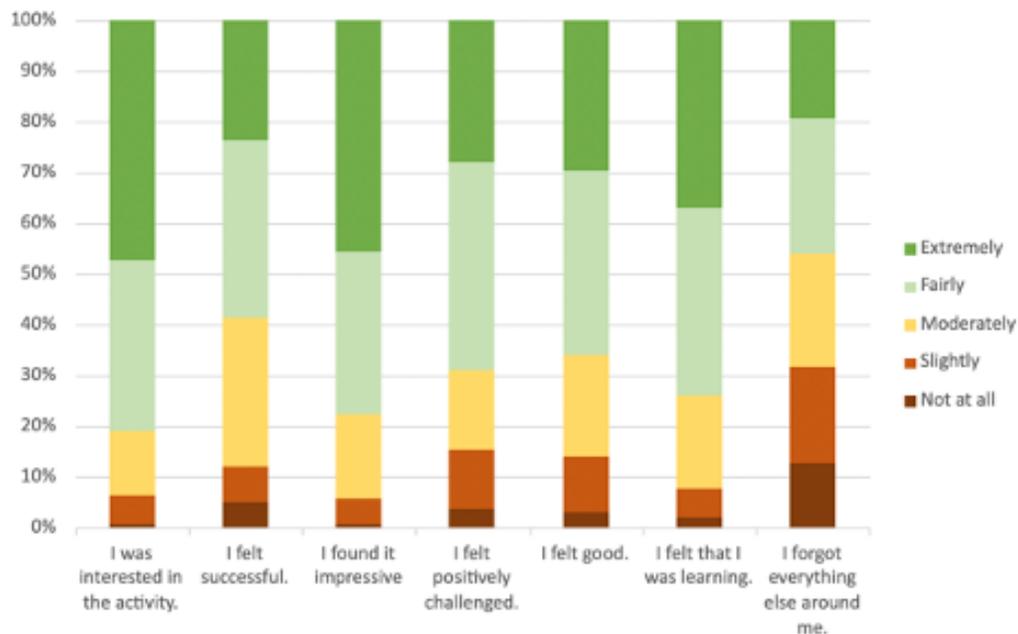
Survey Responses: Student Learning

From the student learning perspective, students expressed overwhelming favorable views:

Ratings of agreement with statements on the use of VR in coursework

Likert Items

Legend: Completely Disagree, Disagree, Neither Agree nor Disagree, Somewhat Agree, Completely Agree, Blank
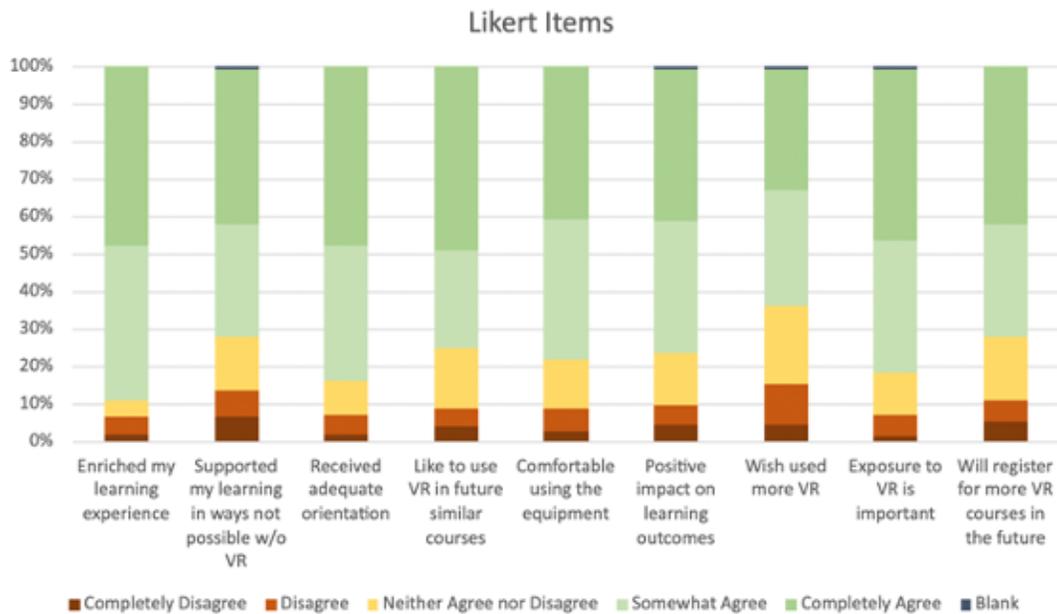
Frequency Factors Impacting Learning and Satisfaction

In examining the data, two factors demonstrate possible influence on students' perspectives on the benefits of VR for their learning and their satisfaction with using VR for coursework:

- In general, *students reported more benefits to learning with VR when instructors incorporated VR into coursework more than five (5) times* over the term.
- Additionally, initial analysis suggests that *students who use VR more frequently outside of the classroom perceive VR in the classroom as being more beneficial to their learning.*

The following graphs compare student perspectives based on self-reported frequency of VR use for non-academic purposes, and on professor-reported frequency of use of VR over the course.

"Using VR in this course enriched my learning experience" by Frequency Factors

	Overall	Weekly	Infrequent	No Use	2 to 4 Times	5 to 10 Times
	Overall	Frequency of Non-Academic Use			Frequency of In-Course Use	
Agree	89.17%	86.36%	89.13%	87.37%	81.25%	95.18%
Neither Agree nor Disagree	4.46%	9.09%	6.52%	4.21%	6.25%	2.41%
Disagree	6.37%	4.55%	4.35%	8.42%	12.50%	2.41%

■ Disagree   ■ Neither Agree nor Disagree   ■ Agree
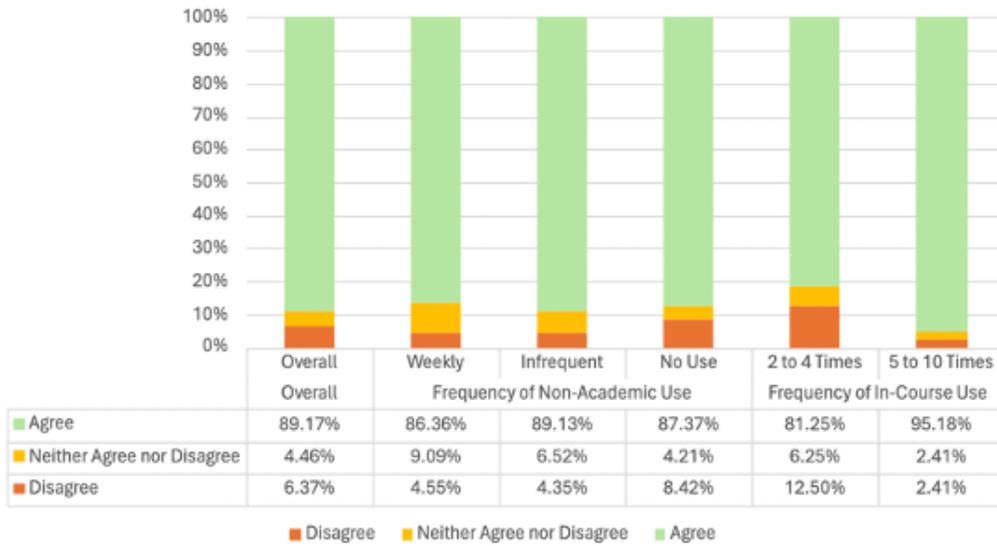
"Using VR in this course had a positive impact on my learning outcomes" by Frequency Factors
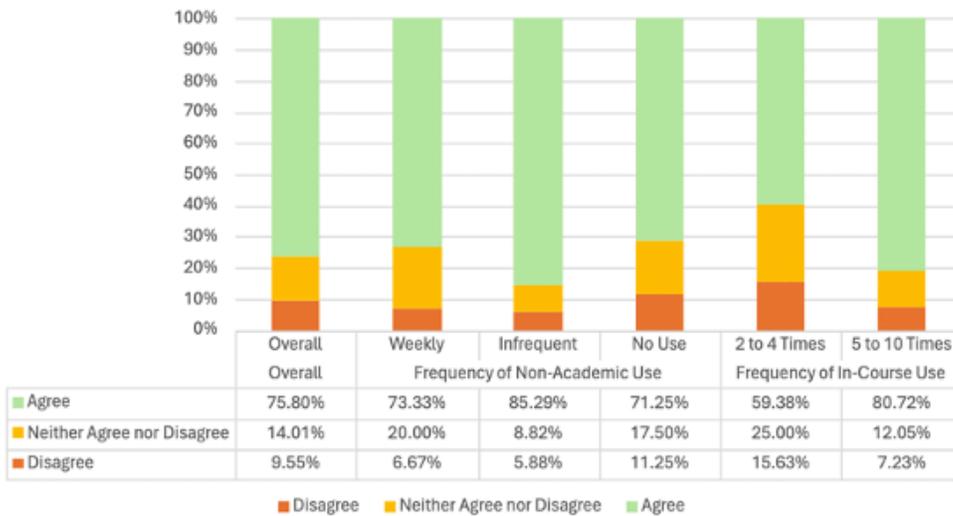
	Overall	Weekly	Infrequent	No Use	2 to 4 Times	5 to 10 Times
	Overall	Frequency of Non-Academic Use			Frequency of In-Course Use	
Agree	75.80%	73.33%	85.29%	71.25%	59.38%	80.72%
Neither Agree nor Disagree	14.01%	20.00%	8.82%	17.50%	25.00%	12.05%
Disagree	9.55%	6.67%	5.88%	11.25%	15.63%	7.23%

■ Disagree   ■ Neither Agree nor Disagree   ■ Agree

"The use of VR in this course supported my learning in ways that would not have been possible without VR" by Frequency Factors

	Overall	Weekly	Infrequent	No Use	2 to 4 Times	5 to 10 Times
	Overall	Frequency of Non-Academic Use			Frequency of In-Course Use	
Agree	72.09%	80.00%	72.73%	71.25%	53.13%	79.52%
Neither Agree nor Disagree	14.73%	13.33%	15.15%	15.00%	18.75%	12.05%
Disagree	12.40%	6.67%	12.12%	13.75%	28.13%	7.23%
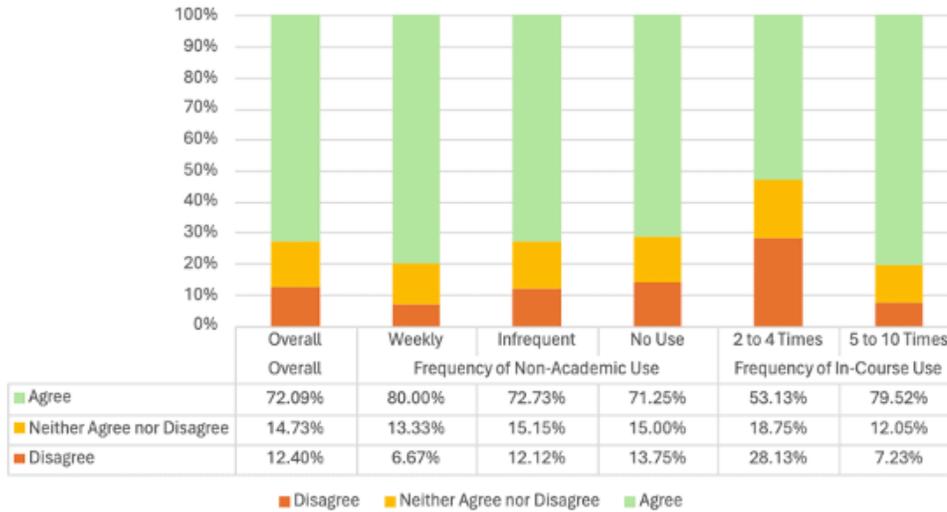
Themes from Students' Open-Ended Responses

Students were provided with an open-ended query soliciting reflections on their VR learning experiences. Six (6) prominent themes emerged and are presented in this table, accompanied by exemplary participant quotes and the frequency with which each theme manifested across responses (Frequency = # of individual respondents coded for the theme / # of total respondents providing open-ended responses).

Theme	Frequency	Example Quote
Engagement and interest	8 (16%)	"The immersion experience helped me retain the course information and made my experience more meaningful than a traditional course."
Future of VR/market	5 (10%)	"As our world continues to evolve with technology, it is always good to get ahead of the game and learn how to navigate VR prior to it becoming widely known."
Maturity of technology	8 (16%)	"I would like to explore the learning opportunities in the future when the technology is more developed."
Desire(d) more	8 (16%)	"I enjoy using VR in the course and I would like to take more classes in the future involving VR."
Learning styles and differences	3 (6%)	"Some students may love VR and learn better with it, and every student should choose for themselves."

INSTRUCTOR INSIGHTS: END-OF-SEMESTER SURVEYS & EMAIL INTERVIEWS

In December 2023 and January 2024, participating professors were invited to submit final feedback and reflections on their experiences using VR during Fall 2023. To accommodate scheduling difficulties, professors who had volunteered for post-semester interviews were issued asynchronous interview protocols: detailed, individualized questionnaires prompting thoughtful reflections. These professors were provided with their own individual definitions of success for VR in teaching from their respective Research Intake Forms and were asked to provide a written reflection on how their criteria for success were met and/or not met. They were further provided with their descriptions of how they planned to use VR instructionally throughout the semester— also from their respective Research Intake Forms—and asked to reflect on how their designed activities unfolded and how teaching specific content using VR compared to teaching the same content using traditional methods. Finally, these professors were asked to share how they make decisions on when and how to incorporate VR into teaching, as well as their motivations for using VR.

In addition to the professors chosen to receive written interview protocols, all other participating professors were sent a similar form-based questionnaire prompting feedback on perceptions regarding the benefit of VR to student learning and whether their expectations were met with the use of VR over the research term.

Between these two methods, seven (7) professors provided post-semester insights. Post-semester responses were overwhelmingly positive.

- All responding professors felt that the use of VR delivered positive impacts on student learning and enabled learning experiences or outcomes that otherwise would have been unattainable.
- Six (6) respondents had their expectations met (n=3) or exceeded (n=3) by VR over the semester. The one professor whose expectations were reportedly not met indicated overall dissatisfaction with having to host a course asynchronously, as opposed to indicating dissatisfaction with the technology or VR experience itself.

Both the tailored written interviews and the form-based questionnaire provided space for open-ended input from professors. The exemplary quotes below illustrate the four (4) themes apparent in the qualitative insights professors provided post-semester: higher student engagement, high student satisfaction, preparing students for the future, and benefits to learning through immersion.

"This definitely provided benefits that were not available in a traditional sense. Being fully immersed ...allowed the students to stay focused...[which] gave them the ability to really absorb the content at a much higher rate."

"I cannot predict whether or not my students will be required to do business in VR five years from now. What I can say is that they have the skills to work in that space—skills that most of their peers do not have on their resumes."

"I feel the criteria [of success] were met as the student evaluation responses of the class were very high."

"Not only were the students' experiences enhanced, but the engagement was evident. [...] Students also mentioned they were looking forward to future VR sessions."

CONCLUSION

This study was designed to answer three driving questions, which are restated below with a summary of findings.

Research Questions

- How does teaching in VR influence and support pedagogical choices?

  This project revealed a tendency among professors to focus on using VR to deliver immersive experiences that would otherwise not be possible (e.g., using VR to visit distant places or travel through time). Some professors indicated using VR to encourage focus and engagement in dispersed learning settings (i.e., as opposed to traditional VOIPs like Zoom).

- How do learning outcomes of VR-enabled experiences compare to those of similar experiences in online and/or traditional course formats?

  Both students and professor respondents overwhelmingly perceived VR as enabling learning experiences and outcomes that otherwise would not have been possible using traditional methods. Many students and professors also indicated that VR learning experiences increased engagement, interest, and focus.

- How do instructors' perceptions and expectations at the beginning of the semester compare with their perceptions and plans at the end of the semester?

Professors' perceptions and expectations remained positive over the semester. At the beginning of the project, professors were asked to individually articulate their criteria for successful use of VR in their courses. Those professors that participated in post-semester interviews indicated that their expectations had either been met or exceeded.

Key Findings

This study sheds light on the impact of virtual reality (VR) in education, emphasizing key insights into its usage and perception among students and professors. Overall, the research found that:

- Instructors found VR use highly successful (96%) and effective (98%), and 100% plan to use VR to teach the same content again in the future.
- All professors believed the use of VR had a positive impact on their students' learning and that the use of VR enabled learning experiences or outcomes that would otherwise have been unattainable.
- Eighty-six percent (86%) of professors' expectations for teaching with VR were met, with 40% saying their expectations were exceeded.
- Students responded overwhelmingly positively to learning using VR: 89% of students agreed that VR enriched their learning experience, and 78% agreed that VR had a positive impact on their learning outcomes.
- Sixty-two percent (62%) of students wished the course had used more VR and 71% indicated they would consider registering for more courses using VR in the future.
- Those students whose professors used VR five to ten times during the semester indicated higher agreement that VR enriched their learning experience (95%) and that the use of VR had a positive impact on their learning (89%), as compared to their peers whose professors used VR only two to four times during the semester (81% and 60%, respectively). Overall, both groups responded positively to VR.

Takeaways

Considering the results and major findings in context provides VictoryXR and its higher education partners and collaborators a number of important takeaways that can inform future use of VR, as well as product development and successful integration:

- Consistent use of VR by professors is crucial for maximizing perceived benefits by students. Aim for at least five uses per semester to see a return on student perspectives of value.
- Younger students tend to find more value in VR in the classroom, which correlates strongly with their frequency of use outside of academia. This trend suggests that as younger students who are already accustomed to VR enter university, they are likely to perceive even more value in its use. Professors also

acknowledge that their incoming students will increasingly be comfortable with VR technologies and believe that students will increasingly make constructive use of VR for learning.

- Regardless of age, frequency of use, subject matter, or content knowledge, students overwhelmingly express positive views on how VR impacts their learning. Very few respondents reported negative perceptions, often attributing any issues to external factors like Wi-Fi or technical glitches.
- Teachers and learners desire more VR in higher education.
- Both professors and students see value in integrating VR into the higher education experience, with open-ended professor insights indicating a primary motivation to prepare their students to be competitive as they join the workforce.

CONSISTENCY IS KEY	PREPARE FOR MORE	IT'S ALL GOOD NEWS	FUTURE OUTLOOK
Consistent use of VR by professors throughout a course is crucial for maximizing perceived benefits by students. Professors should aim for at least five uses per semester to see a return on student perspectives of value.	Overall, teachers and learners desire more VR in higher education. Younger students tend to find more value in VR in the classroom, which correlates strongly with their frequency of use outside of academia. Professors acknowledge that their incoming students will have more previous exposure to VR technologies and believe that students will increasingly make constructive use of VR for learning.	Regardless of age, frequency of use, subject matter, or content knowledge, students overwhelmingly express positive views on how VR impacts their learning. Very few respondents reported negative perceptions, often attributing any issues to external factors like Wi-Fi or technical glitches.	Both professors and students see value in integrating VR into the higher education experience, with open-ended professor insights indicating a primary motivation to prepare their students to be competitive as they join the workforce.

Discussion

Overall, professors and students view the integration of immersive VR in education favorably, emphasizing its potential for enhancing learning experiences and preparing students to be competitive as they join the workforce. Therefore, the recommendation is for universities to proactively adopt and incorporate immersive VR technology into their educational strategies. Results showed that students in younger age brackets tend to use VR more in their daily lives outside of academia, and that higher familiarity with VR in general suggests higher appreciation for VR in learning experiences. Therefore, assuming that VR technologies will be even more widely and frequently used among individuals entering higher education in the next five (5) years, educational outcomes and engagement should benefit from an increase in the incorporation of immersive VR into learning experiences.

This study also provides actionable insights as VictoryXR continues to lead in the application of VR technologies for higher education. Most notably, the results of this study indicate that students perceive the most benefit to their learning, and report higher satisfaction, when VR is utilized more than four (4) times throughout a semester. As VictoryXR onboards additional higher education partners, professors adopting VR into their teaching practices should be encouraged to use the technology five (5) times or more during a semester.

Accounting for extracurricular adoption of immersive VR technologies by individuals who will be entering higher education in the coming years, for the observable effects of frequency of use within a course on student perceptions, and for the overwhelmingly positive perspectives of instructors and learners on the utility of VR in teaching and learning, leaders in higher education should construct intentional strategies to fully integrate VR experiences into their academic programming. A robust immersive VR strategy would account for instructor preparation, the development of best practices (e.g., benchmarks for number of uses during a term), and cross-institutional adoption to support student and instructor familiarity, which this study suggests are key to beneficial learning outcomes.

PARTNERS

Columbus State University

Florida State University

Harrisburg University

Indiana Wesleyan University

Jackson State University

Loyola Marymount University

Luna Community College

Miami Dade College

Michigan State University

Morehouse College

Morgan Community College

Metropolitan State University of Denver

North Carolina A&T

Prairie View A&M University

Southwestern Oregon Community College

St. Ambrose University

University of Alabama - Birmingham

University of California - Irvine

University of Iowa

University of Montana

University of Wisconsin - Parkside

Virginia Tech

West Virginia University

William & Mary Law School

Yavapai College

APPENDIX A

Teaching and Learning in the Metaverse: Research Project Intake Form

Thank you for your interest in this research project. We're excited to learn more about your teaching experiences using VR in the Metaverse: to learn how you define and measure success or effectiveness, to gain a deeper understanding of how you integrate VR into your instructional design, and to further inform decisions on expansion and implementation in the future.

We will use six main tools to gather insights over the course of this grading period (trad. Fall 2023), roughly in this order: this intake form (faculty), brief VR learning event surveys to be filled out after each use of VR in your course (faculty), 30-minute voluntary instructor interviews (faculty), student questionnaires (learners), 30-minute voluntary student interviews (learners), and an end-of-term questionnaire (faculty). We may also work with you and your institutions to review basic institutional data to enrich our analysis and discussion.

Please refer to the email you received that brought you to this form for further information. This email contains links to short videos introducing the research objectives and design. If you have any questions, please reach out to [redacted].

Please note that this study is funded by VictoryXR and overseen by Bâton Global. As such, no IRB review or acceptance was required. Additionally, the nature of the research design is generally exempt from IRB needs. By completing this form you are signaling your reasonable informed consent to participate.

Required

1. Please provide your name.
2. What email address may we use to contact you during this study?
3. Please provide your institution.
4. Course Name (If you are teaching multiple courses this semester using VR, please submit a new form for each course that you would like to include in the research project.)
5. Which classification of students enroll in this course? (Select all that apply.)
   - Undergraduate (Non-Major Course)
   - Undergraduate (Major Course)
   - Graduate (Master's)
   - Graduate (Doctorate)
   - Post-Graduate
   - Continuing Education/Certificate Program
6. How many students are enrolled (or do you expect to enroll) in this course?

7. When does/did this course begin?
8. When is the last day of this course? (Last day of instruction)
9. How frequently do you teach this course?
    - Multiple sections each semester.
    - Once per semester.
    - Once per academic year.
    - At least once every other academic year.
    - This is my first time teaching this course.
10. Have you used VR tools to teach this course before?
    - Yes
    - No
11. Have you used VR to teach any course(s) before?
    - Yes
    - No
12. How many times do you plan to use VR in this course over this semester?
13. Do you use VR in your life outside of the classroom? (For example, for gaming)
    - Yes
    - No
14. Please provide a succinct overview of how you currently plan to use VR in this course.
15. How will you define success in using VR in this course this term?
16. Would you like to participate in a brief instructor interview (30 minutes) regarding your use of VR this semester?
    - Yes
    - No

APPENDIX B

Metaverse Learning Event Survey

Please complete this brief survey after each use of VR in your course over the grading period.

1. Your name
2. Course name
3. Date of the learning event
4. Brief description of the learning event (topic, duration, activities, etc.)
5. Which content or knowledge areas did you intend to support with the use of VR in this learning event?
   - Making complex decisions
   - Collecting and analyzing data
   - Ability to work in a team
   - Presenting information
   - Leadership ability
   - Operational knowledge
   - Procedural knowledge
   - Recalling facts
   - Learning vocabulary
   - Memorizing principles of theories
   - Organizing items in space
   - Sequencing chronologically
   - Reading comprehension
   - Listening comprehension
6. Please rate your agreement with the following statements using the scale:

	Completely Disagree	Somewhat Disagree	Somewhat Agree	Completely Agree
The use of VR in this learning event was successful.				
Learners were engaged.				
Students learned what was intended.				
I will consider using VR again to teach this material in the future.				

7. Would you like to document or share anything else about this learning event?

APPENDIX C

Metaverse Fall 2023 Research Study: Post-Questionnaire for Instructors

As we wrap up our project, we'd like to ask a few questions to gauge your post-semester perspectives on the use of VR in your class(es) this fall. Every question is optional, and we sincerely hope you will take the next five minutes to respond to this brief and final questionnaire.

1. Your name
2. Your institutional email
3. Your institution
4. Did VR exceed, meet, or not meet your expectations for teaching this past semester?
   - Exceed
   - Meet
   - Not Meet
5. Did you perceive the use of VR as delivering positive impacts on your students' learning?
   - Yes
   - No
6. Did the use of VR enable learning experiences or outcomes that would otherwise have been unattainable?
   - Yes
   - No
7. Please feel free to provide any color to your answer selections, if you'd like.
8. Is there any other feedback or insight you'd like to provide concerning your experience using VR this past semester, relevant to student learning outcomes and engagement, past and future andragogical choices, or definitions of success in teaching and learning?

APPENDIX D

Metaverse Teaching and Learning Student Survey

Thank you for collaborating with us to learn more about student experiences learning in the Metaverse. Your input is invaluable! We've designed this survey to take only a few minutes of your time. All questions are optional, though we hope you will answer as many as you feel comfortable responding to. All responses will be anonymized and analyzed by consultants at Bâton Global, who is providing research services to VictoryXR. Neither your professors nor your university will receive or review your particular responses, and all reports shared with stakeholders will be anonymized to protect participant identities.

If you have any questions whatsoever about how your responses will be used, please reach out to [redacted].

1. Gender
   - Female
   - Male
   - Non-binary
   - Prefer not to say
2. Program of Study
   - Undergraduate
   - Graduate
   - Non-degree
3. Age
   - 17-22
   - 23-28
   - 29-34
   - 35-40
   - 41+
4. How often do you use virtual reality (VR) technologies in your daily (non-academic) activities?
   - Yearly
   - Monthly
   - Weekly
   - Daily
   - Never
5. Have you previously used VR tools in an academic setting?
   - Yes
   - No

6. Please indicate how you felt while using VR during class assignments or activities, using the following scale:

	Not at all	Slightly	Moderately	Fairly	Extremely
I was interested in the activity.					
I felt successful.					
I found it impressive.					
I forgot everything else around me.					
I felt completely absorbed.					
I felt content.					
I felt positively challenged.					
I felt good.					
I felt that I was learning.					

7. Please rate your agreement with the following statements regarding the inclusion of VR in your coursework, using the following scale:

	Completely Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Completely Agree
Using VR in this course enriched my learning experience.					
The use of VR in this course supported my learning in ways that would not have been possible without VR.					
I received adequate orientation to the VR equipment to support my learning experience.					
I would like to use VR in similar courses in the future.					
I felt comfortable using the VR equipment.					

Using VR in this course had a positive impact on my learning outcomes.				
I wish this course had used more VR.				
Being exposed to emerging technologies--like VR--is an important part of my education.				
If the option exists, I will likely register for more courses taught using VR.				

8. Would you like to add anything to clarify your responses or share more about your VR learning experience in this course?

APPENDIX E

Metaverse Fall 2023 Research Study: Post-Questionnaire for Instructors

As we wrap up our project, we'd like to ask a few questions to gauge your post-semester perspectives on the use of VR in your class(es) this fall. Every question is option, and we sincerely hope you will take the next five minutes to respond to this brief and final questionnaire.

1. Your name
2. Your institutional email
3. Your institution
4. Did VR exceed, meet, or not meet your expectations for teaching this past semester?
   - Exceed
   - Meet
   - Not Meet
5. Did the use of VR enable learning experiences or outcomes that would otherwise have been unattainable?
   - Yes
   - No
6. Please feel free to provide any color to your answer selections, if you'd like.
7. Is there any other feedback or insight you'd like to provide concerning your experience with VR this past semester, relevant to student learning outcomes and engagement, past and future andragogical choices, or definitions of success in teaching and learning?

APPENDIX F

Additional University Insights: Data Sharing

Three (3) universities elected to participate in the research study through alternative means: one (1) through an interview on measuring success in higher education with VR, which was used to refine the data collection tools used in the current study, and two (2) through providing the results of similar studies being carried out concurrently internal to their institutions. The two (2) sets of results shared with the current study's research team were reviewed, and similar items or question sets were extracted for analysis and comparison to data and results from this study. Below are overviews of selected findings and comparisons, which corroborate the findings of this study:

University A: Data Sharing
What are major benefits to using VR? (Student Perspective)
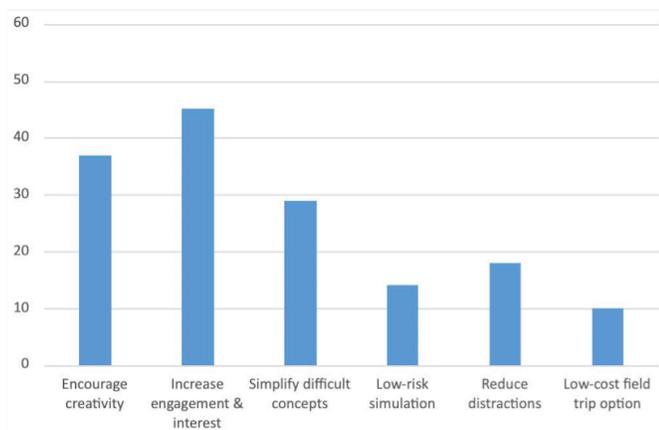
- Students were asked to select up to 3 major benefits to using VR from a close list.

- 58 University A students provided their input.

- For example, 45 students indicated increased engagement and interest as a major benefit of VR.

University B: Data Sharing

Likert scale was used to gauge students' opinions throughout the semester. Table represents composite responses to items similar to those in VictoryXR's research study.

	Content engaging	Prefer over traditional online methods
■ Strongly Agree	16	15
■ Agree	8	9
■ Neutral	3	2
■ Disagree		
■ Strongly Disagree		1

■ Strongly Disagree ■ Disagree ■ Neutral ■ Agree ■ Strongly Agree
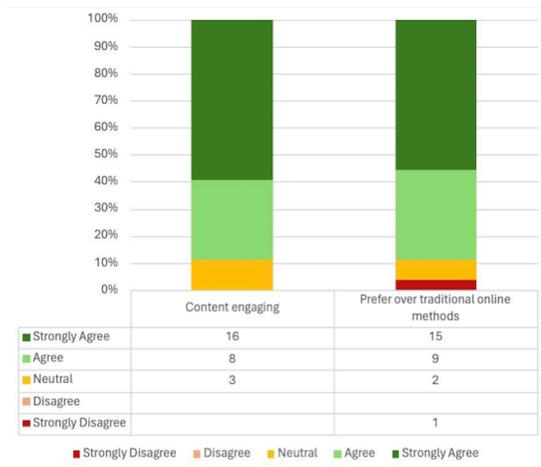
- Seven (7) students are represented by this course's data.

- Results align with VictoryXR's study, indicating students have an overall positive response to VR in their learning experience.

- Results corroborate VictoryXR's findings that students desire (in this case "prefer") VR in their learning experiences.

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