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Evaluating Virtual Reality as a Learning Resource: An Insight into User Experience, Usability and Learning Experience

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About the presenter



Nohemi Rivera Vázquez

Nohemi has a Bachelor degree in Communication Sciences with a focus on Organizational Climate from the Autonomous University of Nuevo León and Master of Education from the Tecnológico de Monterrey. She has had experience in enterprises, working in the training department and participating mainly in the creation of online courses. Nohemi has supported the Strategic Investigation Group (GIEE): Educational Models Innovation (IME) in Tecnológico de Monterrey (ITESM) as a member of the linking committee and as a research assistant. She was also a full-time student in the Ph.D. of Educational Innovation Program in charge of the communications office of the International Council of Distance Education (ICDE-UNESCO): “Latin America’s Open Education Movement.” She worked at Walmart company as an instructional designer. She currently works as a Research Methods and Verbal Expression teacher at the Tecnológico de Monterrey university and as an English teacher and Languages Academic Leader in the Tecnológico de Monterrey high school. She also participates as a research assistant in projects related to the use of technology for education.



Current research topics

- Use of holographic technology in education
- Extended reality in education
- Virtual reality in education
- 360 videos in education
- Educational innovation
- Usability in learning interfaces
- Learning experience with technology
- Competencies development in higher education

Context and participants

- This study took place in a private university located in northeastern Mexico.
- Undergraduate students studying engineering and business were exposed to the use of VR resources for learning purposes.
- The results presented in this paper focus on a VR resource that was designed to collect, calculate and estimate data from a daily activity: going to buy groceries at a supermarket.
- This VR tool attempted to achieve **spatial immersion** (a simulated world that is perceptually convincing).
- In sum, 268 students that were taking the course **“Mathematics and Data Science”** used the VR tool in Monterrey; 76 students were studying at the campus in a presence-based modality and the rest were online students.
- The students used the VR tool for about 1 hour and, during this time, they had to choose 5 foods, trying to get the smallest number of calories possible.
- The objective of the VR tool was to help students to **calculate their caloric intake** and stimulate their interest in the **nutritional value of the food they choose**.

Methodology

The objective of the study was to describe how **usability, user experience and instructional usability** might affect learning results while using VR resources.

The instrument was a mixed questionnaire applied in a focus group technique. The instrument was divided into four sections.

- **Section 1:** contains 6 items about usability and 5 items about user experience. All of them are open-ended questions.
- **Section 2:** contains 12 items related to instructional issues and learning experience. These items use a six-point Likert scale (1= little 6= a lot), open-ended questions and statements that need to be qualified according to a scale in consensus.
- **Section 3:** Contains one open-ended question to make a global appreciation of students' perception of the learning experience using VR and how to improve it.
- **Section 4:** Contains a single-word multiple choice question that asks to select the word that best represents how they felt about the learning experience with VR. There are eight possible options that go from positive to negative emotions or feelings. A mode value is obtained after voting.

Important concepts

Usability

The degree in which an interface is easy to use (Cao, Li, & Liu, 2020).

User experience

The degree in which the user is satisfied with the experience they had with the interface, how attractive it was perceived and the sense of immersion they had (Afzaal, Akbar, Perveen, & Nazir, 2020).

Instructional usability

The degree in which the tool is really motivating and helping students to achieve the learning objective (Wanga, Tsiaia, Lu & Wang, 2019)

Virtual reality

VR is a concept used to describe a virtual, 3D, interactive experience, generated by a computer in which a person interacts in real time with simulated objects that look real (Mandal, 2013).

Results

Strengths

Usability:

- ❖ **Adaptation** to the VR was **fast**.
- ❖ The **interface** was **simple** and **easy to use**.

User experience:

- ❖ **Attractive** experience that excited them.
- ❖ Perceived as something **new** (were glad to go out of their regular classroom activities)
- ❖ Exceeded their **expectations**.
- ❖ Perception of being the character they were controlling.

Learning experience (instructional):

- ❖ Virtual Reality was perceived as a good way to **learn**.
- ❖ The learning **objective** was **clear**.
- ❖ The activity was **related** to their class.

Areas for improvement

Usability:

- ❖ The beginning and end of the activity were quite **confusing**
- ❖ They would have preferred having **instructions** directly in the VR

User experience:

- ❖ **Limited options** in the presented environment.
- ❖ Hearing music or conversations would have made the experience more **authentic**.
- ❖ Not being able to **walk** made students feel **dizzy**.

Learning experience (instructional):

- ❖ They expected to be able to **interpret the information** they collected.
- ❖ They agreed the activity would have been more relevant as an **introductory activity** rather than a practice.
- ❖ There was no **interaction** with other students in real time.
- ❖ They want to use it **more frequently** and in more classes.
- ❖ Being able to access the resource **freely**.

Conclusions and future work

- These results seem to confirm that the features proposed by Mikropoulos and Bellou (2010) strongly contribute to a sense of presence when using a VR tool: free navigation, autonomy, 360 degrees view and the interaction with the objects.
- VR tools are not appropriate for every instructional objective. The students in this study would have preferred to have this experience at the beginning of the semester and they felt that the resource objective was limited; they would have appreciated analyzing the data they collected. This supports Pantelidis (2010) suggestions about creating a pedagogical foundation when designing VR modules; the interaction with 3D objects by itself will not improve learning outcomes.
- Teachers play an essential role when using this technology. Before the experience, teachers should clarify the learning objective of the resource, define the steps students should follow and what is expected from them; after the experience, they should engage students into a discussion about what they learned and how they can apply it.
- This study presents qualitative preliminary results, but the three dimensions will be evaluated using quantitative data, and interviews with teachers will be done. It is important to continue evaluating the characteristics that must be considered when using VR tools in higher education.



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Thank you!

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