

# Motivation for Learning in Virtual Environments

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## Abstract

The use of state-of-art immersive technologies enhanced undergraduate students' motivation to learn. The main variables for the comparative analysis are the opinions of surveyed students for three academic terms and the perception of motivation as an engine for learning. The data used for this article comes from undergraduate students at a Mexican university, Tecnol ógico de Monterrey, during January 2019 up to June 2020. The virtual activity designed for fostering motivation for is called: Welcome to Ur, Mesopotamia. The activity consists of a recreation of the ancient city of Ur using 3D animation and virtual reality goggles. Each student was able to travel back on time and explore by foot the streets, temples, and palaces of the Mesopotamian city. The courses where the educational experiences took place, "Sustainable Cities and Communities" and "Citizenship and Democracy" reported higher satisfaction and motivation to learn that those courses that did not use the virtual tool. The use of technological tools helped students to have better understanding of the academic content. The students reported feeling motivated to learn more about political history due to the immersive learning activity.

**Keywords:** virtual reality, 360 ° video, motivation, perception, learning perception

## 1. Introduction

### 1.1 Introduce the Problem

Immersive technology fosters motivation to learn among undergraduate students. For this article, the students of two different university courses "Sustainable Cities and Communities" and "Citizenship and Democracy" were surveyed about their motivation to learn. Students reported feeling as if they were part of a physical environment that motivated them into having an active participation during the acquisition of knowledge, skills, attitudes, and values (Warbunton, 2009). The design of learning experiences with virtual reality, 360° videos, or augmented reality technologies enhances the teaching and learning process, and the positive perception of the student's motivation and learning (Rodríguez et al, 2020).

An immersive experience with a 360° video was designed along with a pedagogical dynamic for content assimilation and reflection. The immersive resource named: Welcome to Ur, Mesopotamia, represents the possibility of traveling to 3500 BC and touring the city of Ur, Mesopotamia. Additionally, the resource allowed students to read and listen to diverse information about this city and its Sumerian civilization.

### 1.2 Theoretical Framework

The fundamental elements for getting effective learning results are skills, knowledge, and teaching quality. This research focuses on the variable of motivation, noting that academic performance also depends on the student's motivation level. Motivation is defined as the set of internal and external factors determining part of the actions of a person. Several authors investigated the relationships between motivation and learning (Carrillo et al, 2009; Naranjo, 2009).

There are also various tendencies concerning the different types of motivation, as the theories of Maslow, Herzberg, and McClelland show. The McClelland motivation theory (cited by Hampton, Summer, and Webber, 1989) focuses on three types of motivation: achievement, power, and affiliation. Achievement refers to the impetus to succeed and recognition, where motivation develops in setting relevant goals. Power relates to the impulse to generate influence and achieve status; while affiliation considers the impetus to sustain satisfactory personal relationships, the feeling of being part of the group.

On the other hand, Gagné (1985) explains how a stimulus activates a variety of internal events that lead to a behavior. Based on an external stimulus, the information recovery detonates and moves to generate responses; in other words, the information transforms into action. Thus, Gagné identifies two kinds of events: external and internal. External stimuli are observable, refer to the incentives that get to students, as well as to the products resulting from the responses. Alternatively, internal stimuli take place in the student's mind and are inferred from observations of external behaviors, these internal activities that happen in the central nervous system are referred to as learning processes.

Therefore, motivation acts as a motor for learning. Motivation creates a situation for practicing learning and opportunities where learned skills could be useful. Gagné concludes

that motivation is essential for learning, to receive and process the contents; otherwise, students will not process or produce knowledge (1985). In this regard, the use of extended realities in education is recognized as an efficient formation modality, generating advantages in the students' comprehension of the proposed content (Hanson, Andersen, and Dunn, 2019); as well as in the learner's performance (Cagiltay et al, 2019; Jacobsen et al, 2019), and the increase of participation (Lorenzo-Álvarez et al, 2019).

## 2. Method

This research presents data about undergraduate students' perception about the use of immersive technologies as part of a teaching-learning model. The time frame for this article was three academic terms: January-May and August-September 2019 for the "Cities and Sustainable Communities" course and February-June 2020 of the course "Citizenship and Democracy" at Tecnológico de Monterrey. The immersive learning is based on technologies that allow students to live an active and flexible learning experience in a hard-to-reach or high-risk context, through virtual environments where they can develop competencies and apply their learning easily and securely (ITESM, 2019).

For the students of the previously mentioned courses, an immersive resource was designed as a 360° video. The activity consisted in recreating the streets, walls, and temples as well as the dynamics of the Sumerian civilization in the ancient city of Ur in Mesopotamia. The virtual experience was called 'Welcome to Ur, Mesopotamia' because the students were able to travel to the past and witness the major contributions of Sumerian civilization to humanity. The immersive resource ends with a visual representation and information of the city collapse, as the figure 1 illustrates (Gándara & Rodríguez, 2021).

Version 1.0



Version 1.1



Version 2.0



Version 2.0 online



Figure 1. Evolution of the resource ‘Welcome to Ur, Mesopotamia’

The students were surveyed after the interactive activity. The survey for the first experience consisted in four questions that evaluated their perceived motivation, learning perception, and usability. While the surveys after the second and third experiences include seventeen questions arranged in six subgroups about usability, motivation, learning perception, spaces, experience, and reflection. A total of 28 surveys were collected in March 2019, 24 surveys in October 2019, and 31 surveys in May 2020.

The evaluation was realized through a comparative analysis of the student’s opinion in each reference period. Particularly, this research evaluates the items, although the surveys include other topics, as will be shown below. The information-gathering was realized through a student’s perception survey applied after the conclusion of the immersive dynamic. The characteristics of the technological activity are:

- Version 1.0 – The first experience took place on the Spring Semester (January-May 2019). The 360° video consisted of a panoramic home with 16 images in four rounds of carousel with four images per round; in addition to the visual elements, the resource included audios and texts with key information about the city evolution and the Sumerian civilization.
- Version 1.1 – The second experience was during the Fall Semester (August-September 2019). The resource animation was built on the last semester design and combined three different immersive tours in the Ur city: homes, palace, and temple.
- Version 2.0 – The third experience, during the Spring Semester (February-June 2020) was a 100% immersive resource designed in Wonda platform. The dynamic was developed in a distance education model due to the COVID-19 health emergency, for this reason, the experience was through the video transmission of an immersive tour of Ur city.

### 3. Results

The surveyed students of the courses “Cities and Sustainable Communities” “Citizenship and Democracy” at Tecnológico de Monterrey reported a greater motivation for learning thanks to the immersive technology activity. The three experiences (Version 1.0, Version 1.1, and Version 2.0) had their own survey and set of answers.

#### 3.1 Motivation, Understanding, Usability and Esthetics (Version 1.0)

Figure 2 summarizes the answers of the survey for the first experience. The survey for the first experience (Version 1.0, January-May 2019) consisted of three questions:

1. How was your experience in this activity? Understanding as experience the realization of the activities at the session beginning, instructions, use of resources, activities dynamic, and closing.
2. Do you think this experience helped you to better understand the course contents?
3. How do you grade the quality of the technology-based resource considering its usability and esthetics?



Figure 2. Results of January-May 2019 semester

### 3.2 Motivation and usability (Version 1.1 & Version 2.0)

The same set of questions were used for the second experience (Version 1.1, August-December 2019) and for the third experience (Version 2.0, February-June 2020), allowing a direct comparison between their results. The questions are divided by theme, each theme results have a figure to illustrate the data.

For the motivation and usability theme, two questions were included:

- Did I feel motivated to complete the activity related to the resource?
- Did I feel physically and emotionally comfortable using the resource?

And the figure 3 illustrates the answers to those questions.

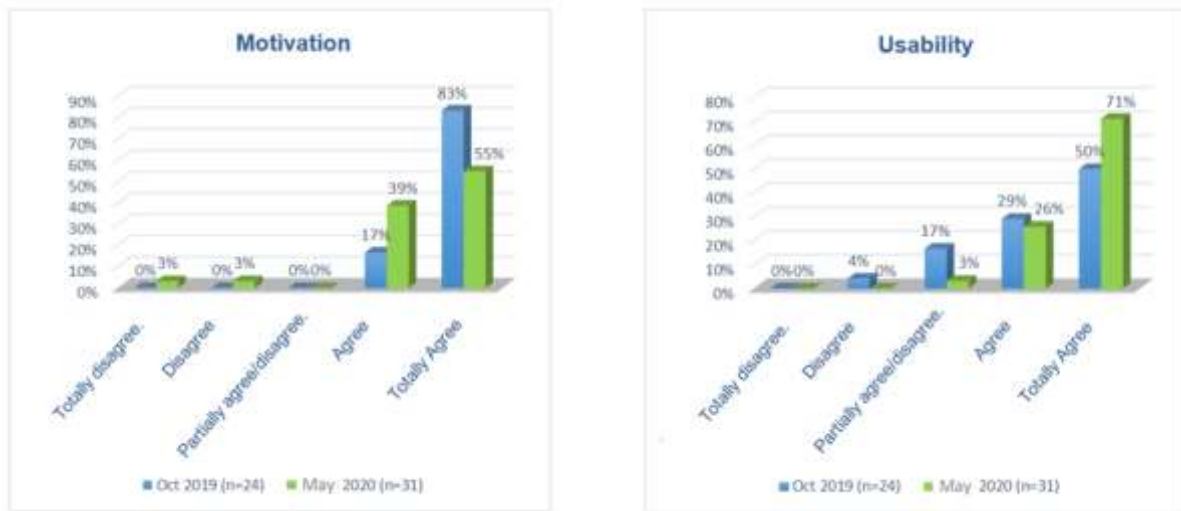


Figure 3. Results of August-December 2019 and February-June 2020 Semesters: Motivation and Usability

### 3.3 Learning Perception (Version 1.1 & Version 2.0)

Concerning the perception of the educational resource/activity efficiency with extended reality, the questions were the following:

- Did the content presentation facilitate a better understanding of the information?
- Did the learning activity with the resource helped me to better acquire the knowledge?

The results are presented in figure 4.



Figure 4. Results August-December 2019 and February-June 2020 Semesters: Learning Perception.

## 4. Discussion

The analysis of the data was focused on the answer's tendencies among the three surveyed

periods. Two factors that must be taken into consideration are that students dynamics change between academic terms and generations as well as the evolution the graphics of the immersive travel to Ur. Also, there was no control group for this study, therefore a contrast between a group with immersive activity and one without it was not possible.

Even if the survey's evaluation scales are only comparable between the second and third experiences, the decision to leave the results was to show the development of the immersive activity during the complete application period. In this regard, only the option of *Excellent* was taken into consideration, and it was compared with the *Totally Agree* option. This allowed to observe more satisfaction percentages in the first period, which could be normal since the first-period survey was shorter and the scale was less disaggregated.

The decrease in the perceived motivation between the second and third experience went from 83% to 55%. A plausible hypothesis is that the second experience students (Version 1.1) were able to use the goggles for traveling to Ur, while the third experience students (Version 2.0) had to do the activity online with a pre-recorded trip to the past.

By contrast –concerning usability and respecting the same scale— there is an increase in the percentage of the answers in the second (50%) and third (71%) experiences (Version 1.1 and Version 2.0). Certainly, the resource utilization was less complex for the student, moving from actor to viewer among the second and the third experience.

About the learning perception, the results indicate a relative decrease in the percentage of the answers that selected the option of *Totally Agree* the second and third experiences, going from 83% to 71%. Once again, this gap could be due to the conditions of face-to-face education which represent more effort for students in the second experience (Version 1.1). Nevertheless, about the acquisition and appropriation of knowledge, we observe a larger proportion of responses between the same periods and response level, moving from 71% to 81%.

Although the previous two results might seem contradictory there were also distinctions between the pedagogical activities in the second and third experiences (Version 1.1 and Version 2.0), which could explain the tendencies in the answers, since during the third experience the implemented activity was the six thinking hats dynamic developed by Edward de Bono for the strengthening and reflecting of the contents (De Bono, 1991); whereas, in the second experience, the activity was a team discussion based on key questions about the contents.

## 5. Conclusions

The use of immersive technology promotes the learning transformation of undergraduate students. The state-of-art virtual reality made a trip to the past possible. The education experience created 3D graphics to explore places that no longer exist. This 360° video allowed a group of Mexican students to travel 5,500 years to the past. The learning process was enriched not only using technology but also by providing stimuli that detonated motivation. The fostered motivation lead students to learn the concepts and contents of the course in a different way.

Even though the evolution in the motivation and learning perception compared is based only

on the three periods tendencies. The conclusion is that there is a greater perception regarding motivation when the immersive dynamic is applied face-to-face, in contrast with virtual modality. The development and improvement of the immersive resource proved relevant for fostering motivation as a learning motor. The pedagogical dynamics are necessary to strengthen and reflect on a course contents.

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