



Conceptualization, Design, Production, and Implementation of Immersive Resources: Welcome to Athens Experience as Educational Innovation to Transform the Teaching-Learning of Citizenship and Democracy

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Abstract

The article presents the process of conceptualization, design, and production of immersive resources, as well as the results of their implementation and evaluation of an experience with immersive technologies at Tecnológico de Monterrey. Educational innovation is presented in the form of technology-aid “time travel” to provide students with an evolutionary vision of the origin of the concepts of Citizenship and Democracy. Immersive learning allows the students to have the feeling of being part of a physical environment and to get involved in their own learning processes under the supervision of the teaching team. To travel to the past, a 360° resource on Greek civilization was designed, which allowed us to delve into Athens in the 5th century BC. Giving visual context to the physical space of the emergence of the concepts reviewed in the Citizenship and Democracy course. The results of the evaluation of the experience show a satisfactory evaluation of 4.87/5 in the opinions about the perception of learning. The authors concluded that the educational innovation allowed to observe a high motivation for learning and that thanks to a perception of presence in three-dimensional environments of classical Greece, the transformation of the learning of Citizenship and Democracy was supported.

Subject Areas

Educational Reform, Educational Technology, Higher Education

Keywords

Virtual Reality (VR), Immersive Learning Experiences, Immersive Educative

Resources, Educational Innovation, Higher Education, Citizenship and Democracy

1. Introduction

The educational innovation “Welcome to Athens” has the purpose of “literally” taking the student into the physical and sociocultural environment of the ancient Greece through virtual reality. This immersive resource allows the possibility of traveling 2500 years into the past and entering the streets of ancient Athens. In addition to the 3D visual support, the various tours are accompanied by auditory information that describes the main characteristics that give context to the emergence of the concepts of Citizenship and Democracy. This resource shows the geographical position of Athens, its temples, buildings and democratic institutions, dwellings, political, social, and cultural activities of its population. It ends with a visual and informative representation of the fall of Greek civilization highlighting its main contributions to humanity.

Within the framework of the Flexible Digital Model of Tecnológico de Monterrey, this experience took place during the February - June 2021 semester for the course “Citizenship and Democracy”. Due to the conditions of the Covid-19 pandemic, the dynamics were carried out remotely via Zoom. Immersive learning has a positive impact on student motivation, achieving active participation in the acquisition of knowledge, skills, attitudes, and values [1].

Citizenship and Democracy is an intermediate level general education course that offers the student elements of historical information and analysis to understand and evaluate, from a critical perspective, the state of the communities of which they are part, in terms of democratic life and citizen participation [2]. As Maiztegui (2008) [3] explains, citizenship is a historical concept inscribed in specific circumstances, whether they are social, economic, political and/or cultural. Therefore, its meaning varies according to the reinterpretation of human needs and the formal recognition of human rights. The concepts of citizenship and democracy have their roots in the anthropological and social conception of the Greek culture of the 5th century BC. [4]

Immersive technology-based learning allows students to have an experiential, active and flexible learning experience in contexts of difficult access or high risk through virtual environments in which they can develop skills and apply their learning easily and safely [5].

We can question whether virtual reality is a vehicle that allows the transfer of knowledge. In this sense, Brown *et al.* (1989) [6] point out that the use of virtual reality combines sensations to generate a perception of presence on site within an environment, allowing interaction with content, environments and 3D situations predisposing the person to carry out critical analysis and to make decisions in everyday life.

However, as Gándara and Rodríguez (2021) [7] explain, the student's experience not only concerns to immersive learning technologies, but it is also mediated by the nature of the educational activities and by the efficiency with which learning can be transferred between the real world and the virtual world. They can propitiate the integration of theory and practice in settings that feel next to authentic to students and in which they can experience a sense of presence.

2. Methodology

As shown in **Figure 1**, the general process for the development of immersive learning experiences can be summarized in five phases: 1) Conceptual definition; 2) Instructional design of immersive activities and resources; 3) Development of the immersive resource; 4) Delivery and training; 5) Evaluation of the experience.

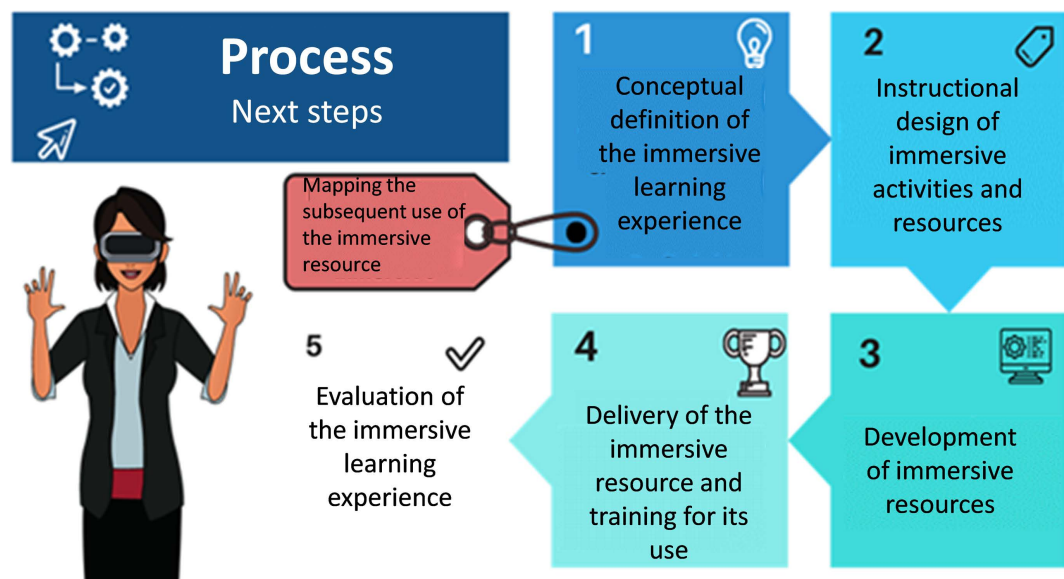


Figure 1. General process for developing immersive learning experiences.

The process begins with the conceptual definition, where the instructional designer works hand in hand with the teacher in several work sessions called “ideaation phase”. The objective is to identify the difficulty in the teaching-learning process to define an immersive resource proposal and achieve an impact on the teaching process. In its conceptual definition, “Welcome to Athens” arose with the purpose of fostering diverse conceptual, procedural, and attitudinal competencies in students. Among them, knowing the origin of the concepts of Citizenship and Democracy and the conditions of the environment in which they arose, understanding their limitations and laying the foundations for monitoring their evolution, as well as assessing the implications of their practice in contemporary times.

In the following phases of Instructional Design of activities and Development of the resource, the instructional designer, programmers, developers, graphic designers, and 3D object modelers take part. These two phases are worked in parallel with a multidisciplinary team based on the conceptual definition, linking the

theoretical and conceptual content of the course with the instructional guideline set by the instructional designer. Thus, the team of developers proceeds to make the virtual reality resource. Once the teacher presents the content, the idea is created, which at this stage is translated into a flow diagram to build the script of what will happen within the resource. **Figure 2** marks the programming route for the “Welcome to Athens” development team, the image details both the content of the resource and the possible navigation paths of the user.

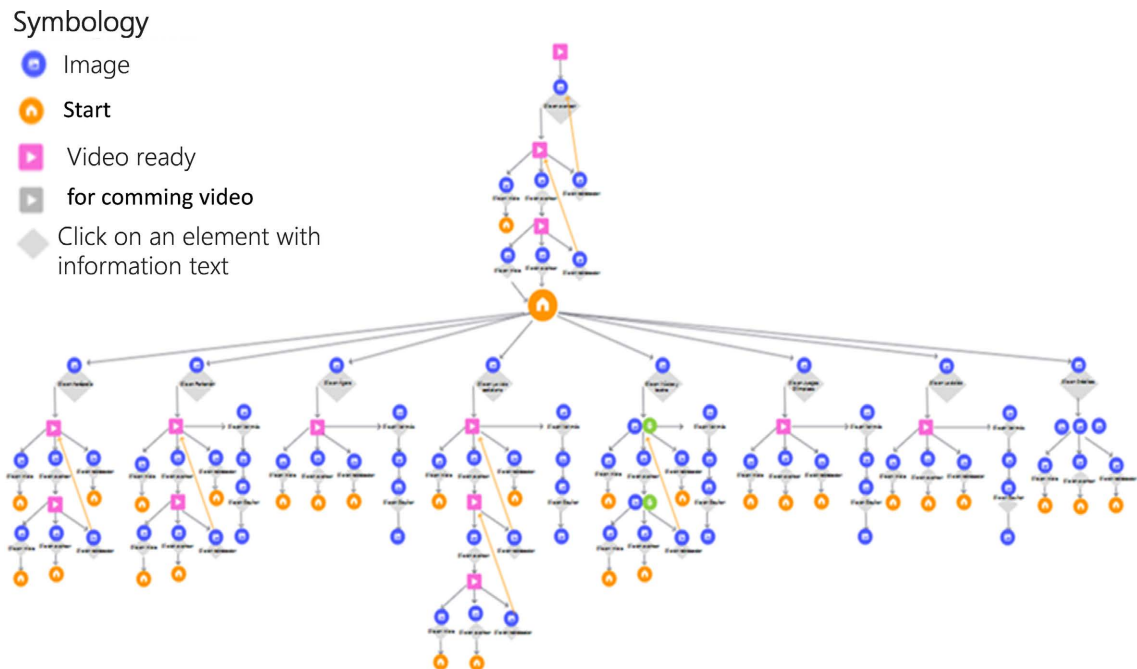


Figure 2. Programming and navigation route of “Welcome to Athens”.

Once the programming route has been defined, the instructional designer and the teacher carry out an investigation on Greek culture with an emphasis on democratic institutions and citizen participation that allow the construction of informative content. Later they structure the messages that will be recorded in auditory capsules. Along with the graphic designers, they also define the soundtrack of Greek music that will accompany the audios.

In each advance of these second and third phases, the collaboration and approval of the teacher is counted on. Thus, the tests and pilots of the construction of the resource are always given with the focus of what is necessary to achieve in the student’s learning. Therefore, at this stage the pedagogical guideline and the evaluation scheme are also designed. These refer to the activities that will accompany the development of the dynamics both in the class session and outside the classroom and to the feedback mechanism. The application of both designs for “Welcome to Athens” is described in the following sections.

In the fourth phase of Delivery and Training, the instructional designer and developers intervene to transfer and ensure that the teacher manages to use the resource 100%. At this stage, it is important to simulate the class session, perform

stress tests and verify the equipment against the number of projected users.

Finally, in the fifth phase of Evaluation of the experience, a feedback instrument is applied to measure the student's motivation, the usability of the resource and their perception of learning. Motivation measures interest in the learning experience; usability values the interaction with the resource and the activity; and the perception of learning confirms the effectiveness of the learning experience and appropriation of content.

3. Results

Innovation description's, its implementation and the results obtained are presented below.

3.1. Graphic Design and 3D Modelling of "Welcome to Athens"

Some of the details of the graphic design and 3D modelling of the production stage are illustrated in **Figure 3**. The general model of Athens begins with a digital model of geographic elevation (Digital Elevation Model-DEM) taking care that the cartographic and orographic lines coincide with the real model so that the surroundings of Acropolis look as realistic as possible. Digital elevation models (DEMs) provide fundamental representations of the three-dimensional shape of the Earth's surface and are useful for a wide range of disciplines. Ideally, DEMs record the interface between the atmosphere and lithosphere using a discrete two-dimensional grid [8].

The lighting includes natural light due to the movement of the sun (time lapse) with animation "Physical Sky—Cinema 4D", emulating a realistic sky by day and the celestial vault at night, from the geographical coordinates, date, and time. In addition to natural lights and shadows effects, there are those associated with the user's movement, such as ascending or descending steps. There are also light effects and leftovers associated to the lighting of candles, torches and/or fire. For these purposes, the Cinema 4D software was used [9]. For time lapse, Cinema 4D has the Physical Sky property, where it is possible to animate the passage of time. For Natural Lights, the Physical Sky property gives the ambient light (sky, sun), and for shadows, the "Soft Shadows" property is available by default.

The textures of each wall, floor, ceiling, column, door, room, or temple surface have been carefully taken care of, as well as the paintings, objects and figures that are part of the decoration of each of the spaces. This has allowed a more precise immersion in the time and characteristics of the Greek civilization. Regarding the chronology, the passage of the centuries elapsed between 431 BC. and 529 AD. in the decline of Athens [10], it is illustrated by a transition of banners next to the script that is heard regarding the dominant empire in each historical moment. The After Effects application was also used for special effects, such as the movement of flags in the wind, among others. After Effects is an Adobe application [11] where the post-production of videos is done, here some final properties are edited such as light levels, color saturation, or the brightness of some objects.

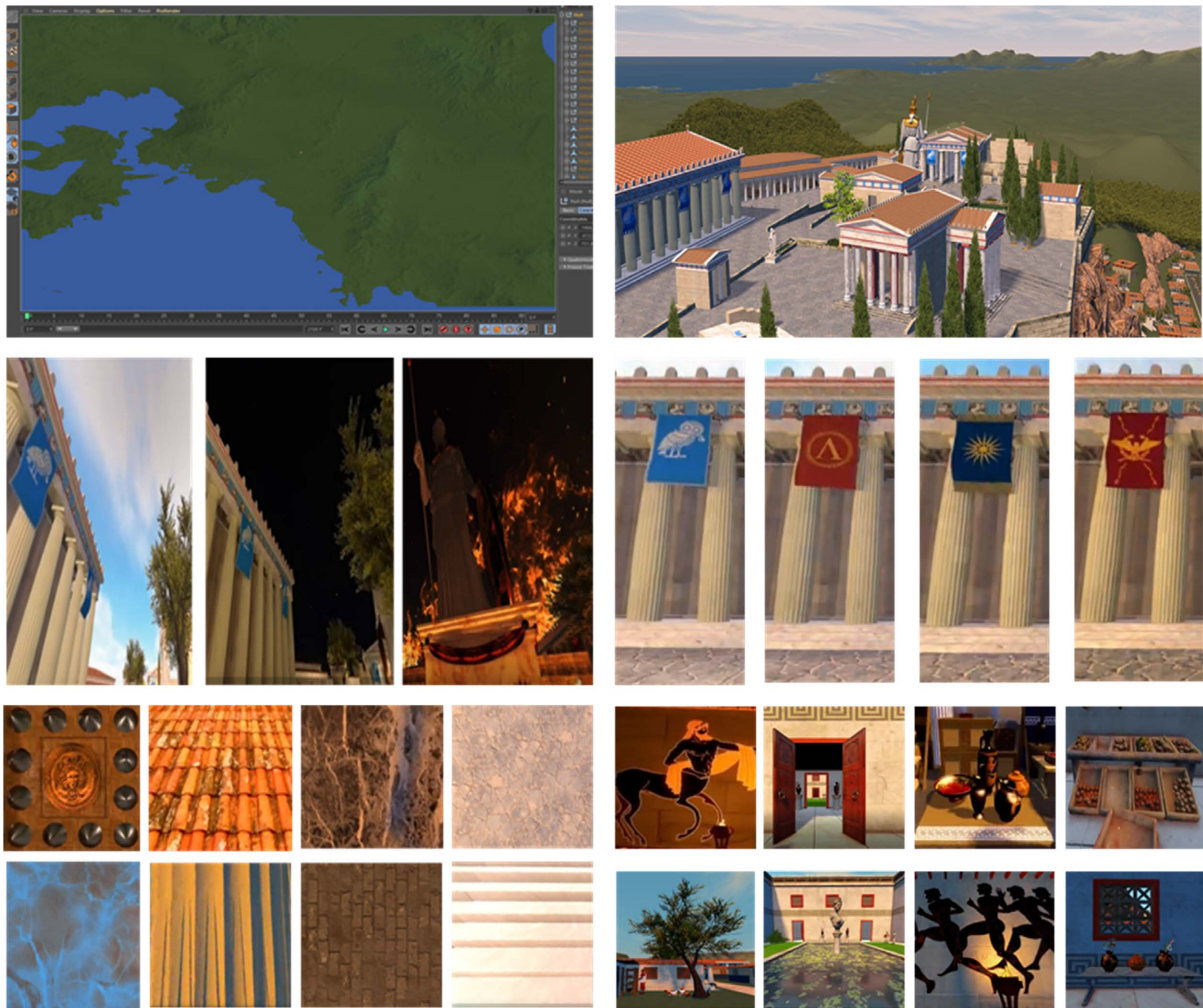


Figure 3. Details of the graphic design and 3D modeling of “Welcome to Athens”.

3.2. Innovation Implementation Process

The educational innovation was implemented during the February - June 2021 semester in the course “Citizenship and Democracy”. The dynamic was carried out with 30 students in the online mode via Zoom due to the Covid-19 pandemic. “Welcome to Athens” has a menu of seven possible navigations to be carried out without an established order: the Acropolis of Athens, the Parthenon, the Agora, daily life, theater and music, the Olympic games, and the fall of Athens, as illustrated in **Figure 4**.

During the session, a standardized guided tour was projected for all students. Subsequently, the group was divided into teams of five participants to answer a series of questions on the topics addressed: 1) Describe for the Acropolis: what was its function? How was it founded? What is its architecture like? And how was it financed? 2) What do we know about the Parthenon? 3) About the Agora, what was its function? What happened in the market? What happened in the Bouleuterion? What happened in the Prytaneum? 4) About daily life, what was an average house like in Classical Greece? How did people live in them? What were the



Figure 4. View and menu of “Welcome to Athens”.

activities, rituals, and diet of its population? 5) Identify four historical events about the decline of Athens.

To close the dynamic, a Kahoot game was played where the students answered specific questions about the information they received during the virtual tour of Athens. This closing activity allowed a playful review of some of the concepts of the course and, at the same time, reflect on the importance of the evolution of the concepts of Citizenship and Democracy and the importance of promoting responsible and active citizenship today. At the end of the session, the students had the resource to live the experience again. Using their cell phones and 3D VR glasses, they had the possibility of having a full immersive experience and reflecting on their experience in the report of the experience.

3.3. Evaluation of Results

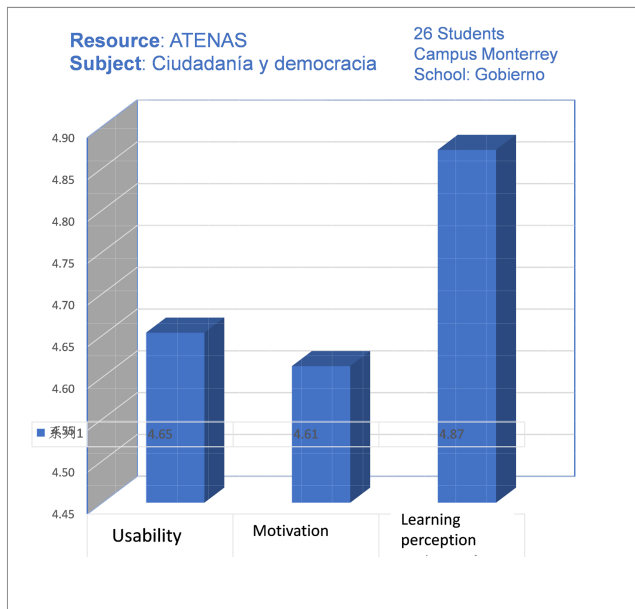
When dynamic ends, a survey was applied to assess the experience of using a virtual reality resource. On a scale from 1 to 5, with 5 being the highest rating, the results of a sample of 26 opinions indicate that Usability obtained a rating of 4.65; this item refers to the interaction with the resource and the activity with extended reality. Motivation, which includes the perception of the use of the resource and the activity with extended reality, was rated 4.61. While Perception of learning obtained the highest score with 4.87; this includes perception and activity with extended reality. The details included in each of these aspects are seen in **Figure 5**.

Motivation acts as a motor for learning. Motivation creates a situation for practicing learning and opportunities where learned skills could be useful. Gándara & Rodríguez (2023) [12] concluded that development and improvement of the immersive resource proved relevant for fostering motivation as a learning motor. The use of immersive technology promotes the learning transformation of undergraduate students. Furthermore, it has a positive impact on the motivation of the students.

The results of the experience were also documented in the final reflections of the students. Here are some excerpts that support their insights:

- “It is much more immersive, it allows you to become familiar with the place,

Results



Scale from 1 to 5 where 1 is the lowest rating and 5 is the highest rating

Figure 5. Assessment of the “Welcome to Athens” experience.

Link of the resource:



What was measured?

Main comments

- It looks like a movie
- That the experience should be face-to-face
- They liked it and felt motivated
- Put up some signs

Usability [Interaction with the resource and the activity with extended reality]

- I entered and easily navigated the resource
- It was easy for me to know how and what to use it for
- I felt comfortable physically and emotionally

Motivation [Perception of resource use and activity with extended reality]

- I was interested and curious about the topic
- I felt that time passed quickly without getting bored
- I felt motivated to do the activity

Learning perception [Regarding the effectiveness of the resource / activity with extended reality]

- The objective of the activity was clear and achievable
- The way they explained the contents helped me to understand the information
- The activity helped me to appropriate the information
- The interface design made my experience effective

it allows us to feel as if we were there, in ancient times. It leaves you in a certain way to place yourself in how life was before, which allows you to feel part of the story...From the beginning it had an impressive introduction, I think it allowed to capture everyone’s attention from the first scene, and throughout the dynamics always maintained an interest. Music also helped...The contents of the resource are relevant since knowing the roots of who we are today, allows us to make sense of the reason of things and therefore it allows us to discover ways to be better”. Cesar Reyes Rodríguez.

- “I believe that the class has set itself the challenge of creating this type of resources to improve the experience and learning of the students, and it has achieved it...It is incredible, the video, the graphics, the music, the voices, among other factors, they are excellent, and the content is relevant, clear, and concise...I am sure that the experience of a 360 video or Virtual Reality dynamics is not given to us by a regular class that consists of only talking about the concepts”. Elda Sarahi Del Rio Santillán.

4. Conclusions

After carrying out the “Welcome to Athens” experience, and based on the observation of the practice, the student reports and results of the evaluation survey, and their own experience in the process of conceptualization, design, production, and implementation of immersive resources, it is concluded:

- A harmonious integration and effective communication of the multidisciplinary team (composed of instructional designers, programmers, developers, graphic

designers, 3D object modelers and teachers), is vital for the success of the experience.

- In addition to the teacher's appropriation of each phase of the process, coincidences between the instructional designer and the modeler, and between the audio and the navigation vision, are essential.
- Distance education is not limited to the incorporation of experiences with the use of immersive technologies. The use of VR lenses for cell phones is becoming increasingly popular; there are even options for self-construction.
- A high motivation for learning is observed and it is confirmed that a perception of presence when interacting with content and three-dimensional environments allows closing the gap in learning compared to the traditional model.

All this has made possible the transformation of the teaching-learning process of the concepts of Citizenship and Democracy.

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Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Warburton, S. (2009) Second Life in Higher Education: Assessing the Potential for and the Barriers to Deploying Virtual Worlds in Learning and Teaching. *British Journal of Educational Technology*, **40**, 414-426.
<https://doi.org/10.1111/j.1467-8535.2009.00952.x>
- [2] ITESM (2011) "P2012 Ciudadanía y democracia". Programa analítico del curso. Tecnológico de Monterrey.
- [3] Maiztegui, C. and Eizaguirre, M. (2008) Ciudadanía y educación: De la teoría a la práctica. Instituto de Derechos Humanos, Universidad de Deusto.
- [4] Maiztegui, C. (2014) La Ciudad, la participación y el ejercicio de la ciudadanía. In: Gándara, G., Ed., *Nuestras Ciudades del Futuro: ¿Cómo hacer sostenibles los espacios urbanos?* Erasmus, 139-154.
- [5] ITESM (2019) Aprendizaje inmersivo con tecnologías, Tecnológico de Monterrey.
<https://innovacioneducativa.tec.mx/es/aprendizaje-inmersivo>

-
- [6] Brown, J.S., Collins, A. and Duguid, P. (1989) Situated Cognition and the Culture of Learning. *Educational Researcher*, **18**, 32-42.
- [7] Gándara, G. and Rodríguez, A.G. (2021) A Virtual Immersion in Urban Sustainability: Past, Present and Future. *Journal of Strategic Innovation and Sustainability*, **16**, 69-74.
- [8] Guth, P.L., Van Niekerk, A., Grohmann, C.H., Muller, J., Hawker, L., Florinsky, I.V., et al. (2021) Digital Elevation Models: Terminology and Definitions. *Remote Sensing*, **13**, Article 3581. <https://doi.org/10.3390/rs13183581>
- [9] Maxon (2024) Cinema 4D, 3D Computer Animation, Modeling, Simulation, and Rendering Software. <https://www.maxon.net/en/cinema-4d>
- [10] HistoryWorld (2012) Timeline: Ancient Athens. Oxford Reference. <https://www.oxfordreference.com/display/10.1093/acref/9780191736452.timeline.0001>
- [11] Adobe Systems (2019) After Effects. <https://www.adobe.com/products/aftereffects.html>
- [12] Gándara, G. and Rodríguez, A.G. (2023) Motivation for Learning in Virtual Environments. *Journal of Social Science Studies*, **10**, 98-106. <https://doi.org/10.5296/jsss.v10i1.20895>