# A Study of High School Students' Experiences and Perceptions of Prosocial Immersive Content

# Estudio sobre las experiencias y percepciones en el consumo de contenidos prosociales inmersivos con estudiantes de enseñanza secundaria

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Abstract

Studies related to the use of immersive technologies in the pedagogical context are giving rise to a new line of research that, for the moment, only focuses on addressing the isolated practices implemented by some educational centres at different academic levels. It should not be forgotten that Virtual Reality (VR), Augmented Reality (AR) or Mixed Reality (MR) are not currently part of the usual educational tools within the teaching-learning process and, therefore, do not contemplate what has come to be known as 'immersive learning'. This is the reason that justifies the study proposed here, which aims to analyse the experiences and perceptions of students when consuming immersive content on social issues. Methodologically, a pre-test and a post-test were designed in order to determine the changes that occur before and after viewing immersive content (360º video) with VR glasses in a sample of 90 students of Compulsory Secondary Education and Baccalaureate between 15 and 17 years of age. The particularity of this study is linked to the gender perspective of the aforementioned contents, linked to the scientific, social, cultural and political contributions and achievements of a group of women from the first third of the 20th century, most of them invisible, who were shared through correspondence with Miguel de Unamuno. The scientific contributions obtained corroborate the findings of previous research related to the potential of the use of VR (360º video) in different educational contexts, but at the same time they show a lack of knowledge on the part of students of immersive technologies, which is accompanied by an absence of didactic content that can be used by teachers. As a consequence of this, and related to the gender perspective analysed, the results again show gaps in terms of women's contributions throughout history and do not show much interest in the use of these technologies to remedy the lack of knowledge about this subject. This opens up new lines of research to explore the potential of the so-called 'Virtual Immersive Learning Environments (VILE)'. The discussion here focuses on the issues related to the production of such immersive content and consequently to its educational use.

Keywords: Virtual reality, 360º video, education, gender, learning.

Resumen

Los estudios relacionados con el uso de las tecnologías inmersivas en el contexto pedagógico están dando lugar a una nueva línea de investigación que, por el momento, solo se centra en abordar las prácticas aisladas puestas en marcha por algunos centros educativos en los diferentes niveles

académicos. No hay que olvidar que, a día hoy, la Realidad Virtual (RV), la Realidad Aumentada (RA) o la Realidad Mixta (RX) no forman parte de las herramientas educativas habituales dentro del proceso de enseñanza-aprendizaje y, por lo tanto, no contemplan lo que se ha venido en denominar como "aprendizaje inmersivo". Este es el motivo que justifica el estudio que aquí se plantea y que tiene por objetivo analizar las experiencias y percepciones del estudiantado a la hora de consumir contenidos inmersivos de temática social. Metodológicamente se ha diseñado un pretest y un postest con el fin de determinar los cambios que se producen antes y después de visualizar contenidos inmersivos (vídeo en 360º) con gafas de RV en una muestra de 90 estudiantes de Educación Secundaria Obligatoria y Bachillerato de entre 15 y 17 años. La particularidad de este estudio viene unida a la perspectiva de género de los citados contenidos, vinculada a las contribuciones y logros científicos, sociales, culturales y políticos de un grupo de mujeres del primer tercio del siglo XX, en su mayoría invisibilizadas, que fueron compartidas a través de la correspondencia con Miguel de Unamuno. Las contribuciones científicas obtenidas corroboran los hallazgos de investigaciones previas relacionadas con el potencial que tiene el uso de la RV (video en 360º) dentro de los diferentes contextos educativos, pero al mismo tiempo evidencian un desconocimiento por parte del estudiantado de las tecnologías inmersivas que viene acompañado de una ausencia de contenido didáctico para que pueda ser utilizado por el profesorado. Como consecuencia de esto y, relacionado con la perspectiva de género analizada, los resultados muestran nuevamente lagunas en cuanto a las contribuciones femeninas a lo largo de la historia y no muestran mucho interés por la utilización de estas tecnologías para subsanar la falta de conocimiento acerca de esta materia. Se abren con ello nuevas líneas de investigación que profundicen en las potencialidades de los denominados "Entornos Virtuales Inmersivos de Aprendizaje (EVIA). La discusión se centra aquí en las cuestiones relacionadas con la producción de dichos contenidos inmersivos y por consiguiente con su uso educativo.

Palabras clave: Realidad virtual, vídeo en 360º, educación, género, aprendizaje.

## Introduction

The consolidation of the digital society characterising the 21st century calls upon us to find new ways of dealing with the changes brought about by the integration of information and communication technologies (ICTs) into all spheres of everyday activity. In this complex digital world, a failure to acquire certain technological skills will result in disadvantages that will become increasingly difficult to overcome, especially among older sectors of the population (Cabero & Ruiz, 2017; Olarte, 2017). In this context, education plays a key role as one of the most important mechanisms for mitigating the effects of such disadvantages. From primary level to higher studies, every level of the education system faces significant challenges as it adapts to the new demands of digital natives who are increasingly reluctant to use the traditional methods that have characterised the educational process up to now (Herrera et al., 2023). However, the relentlessly fast pace at which digital technologies are currently developing poses a serious problem for the education system, as this severely complicates the task of training teachers in how to use them for pedagogical purposes in their classes, due mainly to their lack of previous technological training (López et al., 2019). This situation exposes a technology lag in the education sector, which seems to be a step behind in the task of equipping students with the knowledge management and complex thinking skills they will need to adapt successfully to the new rules of the game determined by Industry 4.0 (González-Pérez & Ramírez-Montoya, 2022; Kipper et al., 2021).

The prospects for the future offered by these new developments define what is being referred to as Education 4.0, which places the focus on these very questions with the aim of working with an approach characterised by digital teaching methods (Bujang et al., 2020). In this sense, it is already possible to speak of an educational metaverse in which immersive technologies such as virtual reality (VR), augmented reality

(AR) and mixed reality (MR) are beginning to be used in classrooms, although this use is still very much in its incipient stages, as new educational resources (George-Reyes, Ramírez & López-Caudana, 2023) that are facilitating what has come to be known as experiential learning (Lino & Zamora, 2023).

In this type of learning, prosocial content plays an important role that until very recently was not given much attention, as it offers students an opportunity to engage in first-person social situations by means of immersive technologies. The aforementioned concepts of digital convergence, education 4.0 and the use of immersive prosocial technologies in the field of education form the backbone of the object of study addressed in this article, both from a theoretical and empirical point of view. Specifically, the use of VR (360º video) is analysed through an experiment carried out with secondary school students in a school in Salamanca (Spain). The line in which this research is framed focuses on exploring how a technology that immerses users in a virtual world (360º video) can open up new pedagogical possibilities; especially in the experiences and perceptions of students' consumption of immersive prosocial content with a gender perspective, this being one of its main singularities and contributing to expanding knowledge within the aforementioned theoretical framework. Both issues will be discussed in depth below.

## Theoretical framework

### *The use of VR in an educational context*

Technology and digitalisation have become defining features of the world we live in today. Very few facets of our lives have been left untouched by these two phenomena, which have changed our way of living, and particularly the way we interact with one another. The newer generations are now being socialised in these technological contexts from a very young age and have to deal with completely new situations in both their personal and social lives. In this reality, education becomes vital as a means of integration, for the development of new educational, social and employment skills. As a result, every level of education is currently undergoing one of the most significant revolutions of recent decades, giving rise to what has come to been known as the new paradigm of Education 4.0 (Ramírez-Montoya et al., 2022). In this regard, as Miguélez-Juan et al. suggest:

> Now more than ever, teachers have the opportunity to promote learning environments that will allow students to access an Education 4.0 that will enable them to take part in their own learning process, while at the same time facilitating their participation in social, economic, political and civic contexts. Only in this way will they be able to solve the problems affecting the world through the use of the technology and digital resources they manage so well (2019, p. 158).

Computers with internet access, digital screens, mobile devices, open-source learning platforms like Moodle, educational apps and online materials, etc., have become regular teaching resources in primary schools, high schools and, of course, universities (Ramos, 2021). They have not replaced traditional teaching methods but instead coexist alongside them, and it is here that both teachers and students face the biggest educational challenges, associated with the new interactions between all the parties involved in the teaching process (Karakose et al., 2023). ICTs are no longer merely educational supports but have become instrumental for innovative practices that are giving rise to new ways of teaching and learning (Coll, 2009). An example of this are pedagogies that contemplate teaching-learning practices through gamification that enhance student participation through the use of games (Papadakis & Kalogiannakis, 2019; Zeybek & Saygi, 2024; Zourmpakis et al., 2023).

The latest additions to this context of innovative education are immersive technologies, VR, AR and XR (extended reality), which are laying the foundations for new, more active, student-centred learning experiences (Arevalillo-Herráez et al., 2023). Specifically, these technologies provide students with highly original experiences, thanks to the use of new devices in the classroom, such as VR headsets and haptic devices, but also because they allow them to interact with virtual objects in 3D, participate in reconstructed environments and explore places and situations that they would otherwise only be able to experience theoretically, thereby revolutionising the educational process (Sukhdeve, 2021; Tabash-Pérez & Sandoval-Poveda, 2021). The result of all this is the incipient development of an immersive educational model associated with experiential learning, or what could be described as a Virtual Immersive Learning Environment (VILE). Specifically, some teachers are incorporating 360º video in their teaching practices at different levels of the education system, including primary (Araiza-Alba et al., 2020), secondary and high school (Barreda-Angeles et al., 2021; Ivars-Nicolás et al., 2020; Espinoza et al., 2024) or higher education (Baxter & Hainey, 2024; Khamis et al., 2024; Kosko et al., 2019).

The interest aroused by these new possibilities of immersive learning has led to the pursuit of research on this phenomenon from an interdisciplinary perspective. Although this is a very recent development, it is resulting in a prolific academic corpus, and a very necessary one given the major changes this type of learning promises to make to the education sector (Villalobos, 2024). The most recent research, such as the study by Calderón et al. (2023), shows an increase in the number of papers focusing on post-secondary education from 2021 to 2022, with studies that analyse the potential of VR for enhancing student comprehension and engagement. But there has also been research exploring the possibilities of VR for improving comprehension of content and academic performance, from primary level right up to university (Córcoles-Charcos et al., 2023; Pérez et al., 2023). Some of these studies examine how to use immersive technology to increase motivation in the learning process (Campos et al., 2020; Ho et al., 2019; Rockstroh et al., 2019; Sattar et al., 2019). Others, such as Sánchez (2023), analyse the potential of VR for people with disabilities, by breaking down the barriers of the physical world.

Studies exploring the motivational component as an important factor in the learning process are of particular interest for this research. Keller (1987; 2008; 2010) associates motivation with four variables: attention, relevance, confidence and satisfaction. This is what is known as the ARCS Model, and it is currently being used as the theoretical model for research on the degree of student motivation generated by different teaching resources, including immersive technologies. This research includes studies by Marín et al. (2018) and Stockdale et al. (2023) on the use of VR, and by Aroca-Reyes & Llorente-Cejudo (2023), Barroso-Osuna et al. (2018), Chang (2021) and Laurens-Arredondo (2022) on AR.

Until very recently, the focus was on the introduction of technology into the classroom, but experience has shown that educational innovation cannot be achieved by technology alone; instead, it is the product of what teachers and students can do with that technology for educational purposes (Gómez et. al, 2011; Johnson et al., 2019; Marín et al. 2022). For example, there is no benefit to equipping classrooms with digital whiteboards—although it has been demonstrated that when used effectively they can be a very helpful educational support with applications for all ages and curriculum areas (Fernández, 2001)—if they are merely used like projectors or traditional whiteboards, because in such cases they end up being mere decorations rather than teaching tools (McClintock, 2000; Toledo & Sánchez, 2015). The same is true of immersive technologies, which are only of interest for the educational content that teachers and students can work on with them in the classroom (Rodríguez & Paíno, 2022).

*The social approach to immersive learning content*

The use of immersive tools in the classroom offers potential benefits not only in relation to the acquisition of curriculum knowledge but also in terms of the development of transversal competencies, such as analytical thinking, active learning and learning strategies, complex problem solving, critical thinking, creativity, leadership, digital competencies and resilience (George-Reyes et al., 2023; Vázquez, 2020).

The development of these competencies is directly associated with immersive content that is currently available and that could potentially be used in classrooms to promote prosocial attitudes and behaviours. Although still in its incipient stages, an interesting scholarly debate is developing in relation to the new storytelling strategies offered by immersive technologies, examined from a communicative perspective. The main research findings are beginning to associate the cultivation of values of justice, impartiality and fairness in immersive technology users with the development of a better society (Canet & Pérez-Escolar, 2022; Martínez-Cano, Lachman & Canet, 2023). Authors such as Walewijns et al. (2023) have analysed how the use of VR content can strengthen intentions to donate to a charitable organisation and point to its value for fostering positive attitudes and inducing prosocial behaviours. This idea can also be found in studies like the one by Martínez-Cano, Ivars-Nicolás & Martínez-Sala (2020), which reveals that the quality of dual ubiquitousness associated with VR facilitates the cultivation of prosocial behaviours, suggesting that it could be considered a tool for social action.

Of special interest to this study are perspectives that associate the idea of prosociality with the concept of empathy in the context of immersive storytelling. The latest research, such as a study by Baía (2023), poses an interesting challenge to the existing scholarly literature by taking a critical view of the notion of VR as a so-called "empathy machine". On this point, Baia observes:

> We realized we cannot use terms such as empathy or social change without a critical approach to support them; and most importantly, the need to demystify the idea of empathy as the ultimate key to unlock social change is paramount. (Baía, 2023: 148).

One social issue that research on the use of VR for prosocial purposes has explored in particular is the question of the gender perspective. This is an issue that has so far mainly been addressed in traditional educational methods where the textbook was the main educational resource (Porras & Ruiz, 2024). This literature highlights the fact that stereotypes and gender roles have been perpetuated in these educational publications. This shows that far from overcoming and correcting gender inequalities continue to occur in the school context (Papadakis, 2018). As far as immersive technologies are concerned, the literature is currently scarce and focuses on the issue of violence against women. For example, Ventura, Cardenas & Baños (2021) conducted a study to observe attitudinal changes in a group of men after viewing 360º content in which they take the perspective of a woman who has been the victim of harassment, with findings suggestive of a reduction in sexist attitudes. Along similar lines, research by Colás-Braco & Quintero-Rodríguez (2020) assesses the impact on adolescents of a campaign in VR launched on YouTube against gender-based violence, finding evidence of an emotional impact on the participants. On the other hand, Vaca (2022) analyses the strategy of various campaigns in Argentina aimed at exposing gender-based violence among young people, concluding that these campaigns manage to achieve four objectives: to inform, to encourage positive action, to change behaviours and to alter societal values.

In the scholarly literature reviewed, no studies were found that explore the potential of immersive technologies to enhance the visibility of women, and specifically, their contributions to history, in prosocial

content evaluated in an educational context. The study described in this article is intended to fill this research gap.

## Objectives

The general objective of this research is:
To explore student experiences and perceptions of immersive prosocial content related to the visibility of women of the early 20th century.
This general objective in turn involves the following specific objectives:

1. To analyse the use of VR by secondary students.
2. To analyse their perception of the educational potential of immersive content with a gender perspective in the classroom.
3. To determine the extent to which VR could help promote gender equality in an educational context.

## Materials and methods

### *Participants*

A total of 90 students participated in the study, from four 10th year classes at a high school in Salamanca, Spain. The gender breakdown of the group was 55.6% female and 42.2% male, while 2.2% did not identify as either gender. The ages of the students ranged from 15 to 17 ($M_{age}$=15.44, SD=0.563). In order to take part in the experiment, they were asked to participate voluntarily, explaining in advance the content of the experiment and the anonymity of the results.

### *Design and procedure*

The research was developed through an experimental approach in the third trimester of the 2022-2023 academic year. A total of four sessions were held, one for each class, in a classroom at the school. The students were required to complete a questionnaire before (pre-test) and after (post-test) viewing a range of immersive content with low-cost VR headsets provided for the purpose. For this study, a total of seven 360º videos were selected, with durations ranging from 1:33 to 6:01 minutes. In each video, a voice-over reads a letter addressed to the Spanish philosopher Miguel de Unamuno, written by a prominent woman of the early 20th century, referring to different political, social, cultural or personal issues, while the viewer is able to take a virtual tour of the Unamuno House Museum at the University of Salamanca. The women referred to in the videos are: Carmen de Burgos (writer and journalist), Matilde Brandau (Chilean lawyer and pedagogue), the Marquise del Ter (French pianist and feminist), Pilar Montaner (painter), Ángela Barco (writer and journalist), Margarita Ferreras (writer and poet), and Mathilde Pomès (French poet, translator and literary critic) who are not part of the curricular content of the surveyed students, but stand out for having made important contributions in different scientific areas. However, most of them have been invisibilized, unlike their male contemporaries who are present in the different secondary school textbooks (Bianco, 2018; Saura, 2022). These immersive pieces were created with the consumption of audiovisual

content by young people in mind, who increasingly demand new narratives to be consumed on new technological media (Feridouni & Ahmed-Mohamed, 2024). All of the participants were previously informed of the content and told how to access the videos on their mobile phones and how to connect their devices to the VR headsets. None of the participants had seen these immersive videos before.

*Variables and instruments*

The questionnaires created to collect the information (pre-test and post-test) were designed *ad hoc* for this study with quantitative and qualitative questions structured into three thematic sections in order to be able to give content, in turn, to the three specific objectives set out in this study:

1. *The use of virtual reality and the perception of its educational potential*, adapted from Miguélez-Juan et al. (2019). This section includes questions about students' use of technology and their previous exposure to immersive content. It also contains two items with an answer format that uses a Likert scale from 1 to 5, ranging from "not at all" to "a lot": "I would like to use VR devices in the classroom as an educational tool" and "I think the use of virtual reality could increase my interest in the content taught in class."
2. *The presence of women in educational content,* adapted from Sierra (2022). In this section, a scale from 1 to 5 was used for two items: "I think the contributions and achievements that women have made throughout history are sufficiently studied at school" and "I would like more women to appear in the content we are taught at school." Open-ended questions were also included to allow participants to indicate which prominent women they were aware of and why.
3. *Virtual reality as a means of discussing and promoting gender equality*. Once again, a scale from 1 to 5 was used, this time for three items: "I think the use of immersive educational content (VR) could help make the scientific, cultural, social, political, literary and other contributions of women more visible", "I would like to see more educational content in VR that addresses gender issues" and "I think the use of educational content in VR could help promote gender equality at school."

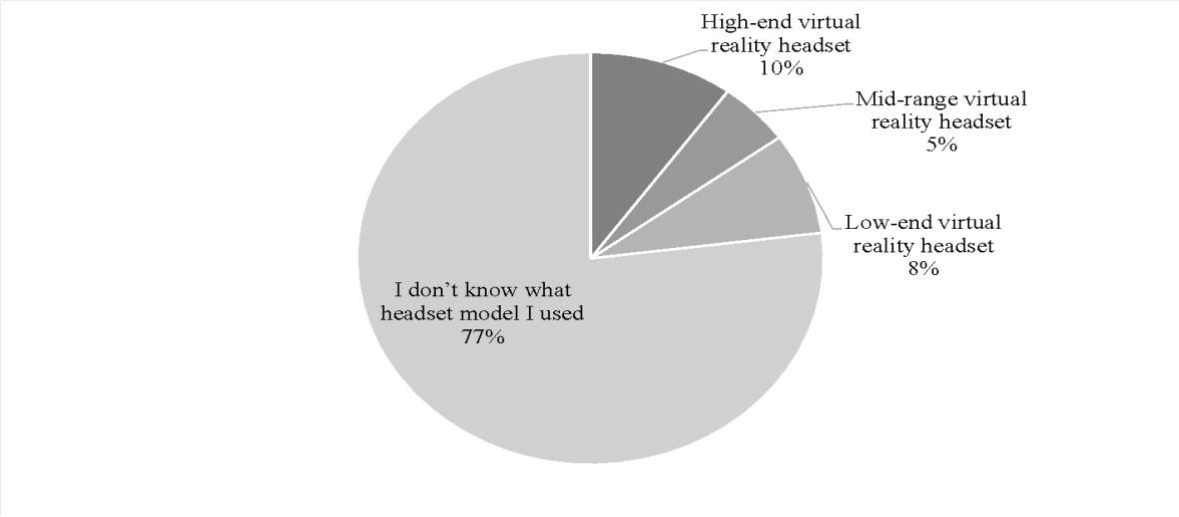
*Processing of data*

For the statistical processing of the data obtained in the questionnaires, the statistical software package SPSS V24 was used. A descriptive analysis of the variables measured was performed on both the pre-test and the post-test, and a Student's t-test for dependent samples was used to verify the differences between them.

## Results discussion

Once the analysis has been carried out, in relation to the previous use of VR glasses, which refers to the first specific research objective, the results of the pre-test show that most of the participants had previously used these devices, either once (32.2%) or several times (38.9%); but they do not know how to distinguish between the different types of devices available on the market. In fact, as graph 1 shows, the largest percentage of students surveyed acknowledged not knowing which model of glasses they had used.

Figure 1: VR headset models used previously by the students

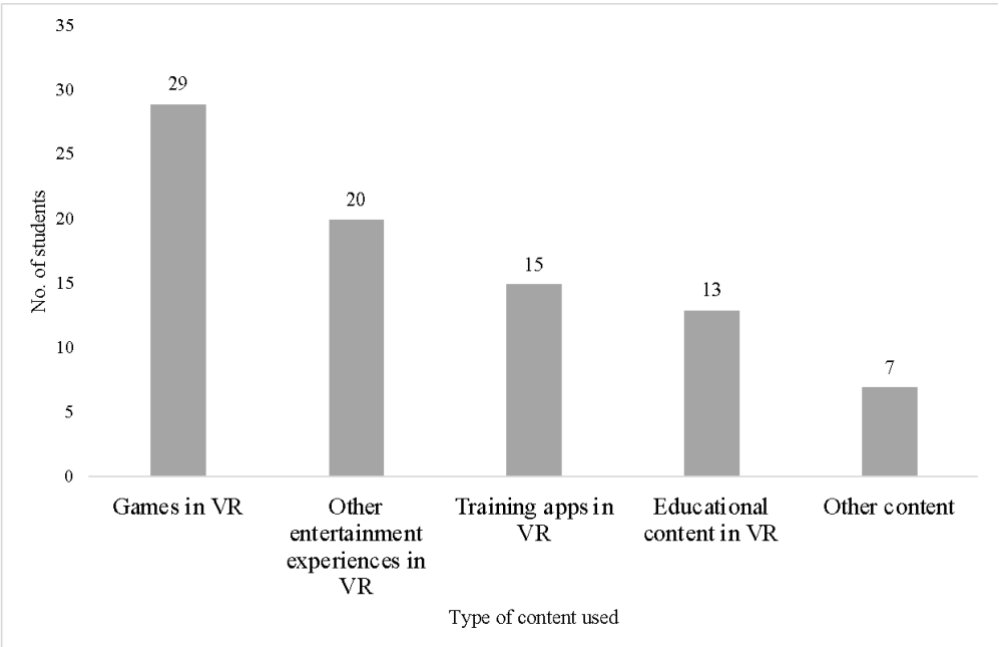



Source: Prepared by authors

Within the range of students who do know how to differentiate between the different existing visualisation devices, the highest percentage say they have previously used high-end glasses, such as Oculus Rift or HTC Vive; followed by low-end glasses, such as Google Cardboard and other similar ones that involve the simultaneous use of a mobile phone; and finally mid-range glasses, such as Samsung Gear VR.

On the other hand, in terms of the type of content consumed by the people surveyed, the most popular types of content are recreational: VR games and entertainment experiences such as films, concerts or virtual exhibitions. There is also a percentage of students who have used immersive technologies through training and simulation applications for different sports. To a lesser extent, some participants indicate that they have at some point accessed educational content in VR (Figure 2).

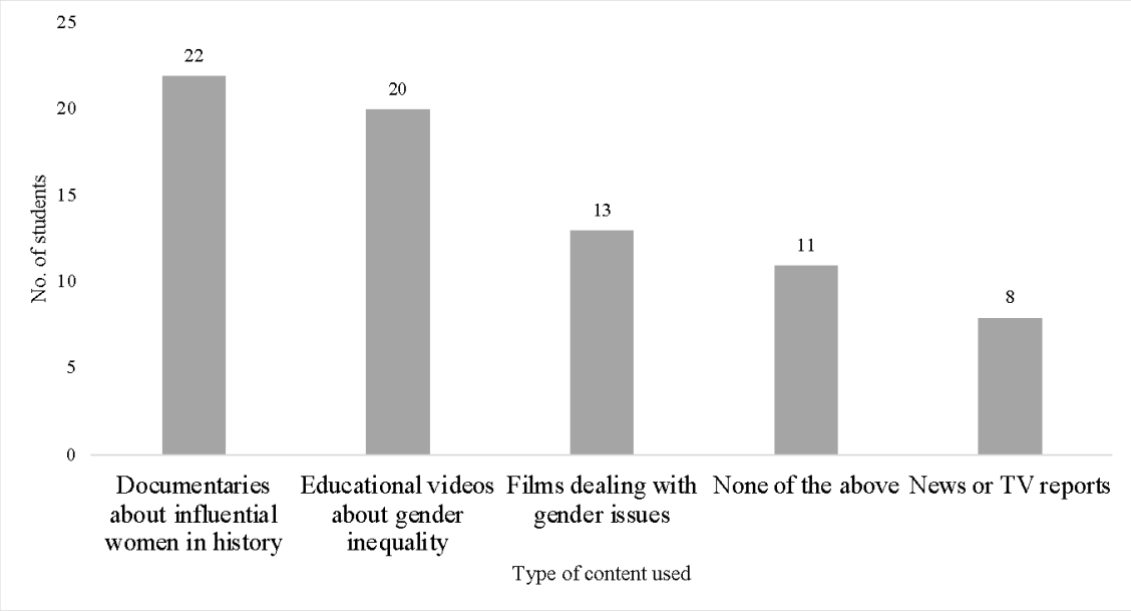
Figure 2: VR content previously viewed by participants




Souce: Prepared by authors

On the question of the gender perspective, linked to the second specific research objective, participants were first asked about their exposure to audiovisual content dealing with gender issues in classrooms, with the results showing that the majority (58.9%) had not been exposed to any such content before. Of those participants who had viewed such content, 41.1% specified that they had mainly seen documentaries and educational videos (Figure 3). This relates to the response that students gave in relation to their exposure to this type of content in VR, as 87.8% reported that they had never viewed this type of content in an immersive format.

Figure 3: Audiovisual content with a gender perspective viewed previously by the participants




Souce: Prepared by authors

In the section of the pre-test dealing with the presence of women in educational content taught at school, participant responses to the statement "I think the contributions and achievements that women have made throughout history are sufficiently studied at school" tended towards the middle of the Likert scale, suggesting uncertainty about whether this statement was entirely true (M=3.21, SD=1.096). In other words, very few respondents opted for the extreme values, which reflects a clear indecision in relation to this question, which is linked to the following one. In this respect, when asked about their knowledge of women who had contributed to science, culture, literature or politics or society in general but who have historically been ignored or rendered invisible, 37.8% of participants reported uncertainty about which women may have been ignored in history, 41.1% claimed they could name an example, while only 15.6% believed that they knew of several women who had been rendered invisible or ignored in history. Moreover, the responses to the open-ended questions reveal that the students were only able to identify two women, both in the field of science: Marie Curie and Lynn Margulis. On the other hand, they ignore women from other fields, such as literature. Responses to the statement "I would like more women to appear in the content we are taught at school" were also located towards the middle of the Likert scale (M=3.48, SD=0.915). This is a striking result, given that they have previously acknowledged a lack of knowledge on this subject.

In the case of the post-test, the scores for participant responses to the statement "I have enjoyed learning about women of the 20th century and their correspondence through immersive content" were above the midpoint on the scale (M=3.83, SD=0.768). Most students also reported that they had "enjoyed using a VR headset to learn about gender issues" (M=4.14, SD=0.931). The scores for student responses to the question of whether viewing the immersive content had enhanced their "knowledge about the women who wrote to Miguel de Unamuno" also tended towards the middle of the scale (M=3.66, SD=0.938), as did the scores for student responses to the statement "I think the immersive content about the women who wrote to Unamuno has helped me understand and value more the role of women in society" (M=3.53, SD=0.985). These data again show a lack of decision on the part of the participating students, who have not opted for the minimum or maximum values of the scale.

Going deeper into the comparison between the pretest and the posttest, and in reference to the last specific objective, the participants have shown an increase in three of the items from the pretest mean to the posttest mean. These three responses were to the statements "I would like to use VR devices in the classroom as an educational tool" ($t(89)=-.179$, $p=.859$), "I think the use of virtual reality could increase my interest in the content taught in class" ($t(89)=-.779$, $p=.438$) and "I would like to see more educational content in virtual reality that addresses gender issues" ($t(89)=-.397$, $p=.692$). Conversely, for the items "I think the use of immersive educational content (virtual reality) could help make the scientific, cultural, social, political, literary and other contributions of women more visible" and "I think the use of educational content in virtual reality could help promote gender equality at school," the mean scores in the post-test were lower than they were in the pre-test (Table 1).

Table 1: Student's t-test for related samples

| | Pre-test | | Post-test | | T | gl | p |
|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | | | |
| "I would like to use VR devices in the classroom as an educational tool" (1-5) | 3.28 | 0.862 | 4.30 | 0.756 | -0.179 | 89 | .859 |
| "I think the use of virtual reality could increase my interest in the content taught in class" (1 -5) | 4.07 | 0.922 | 4.17 | 0.851 | -0.779 | 89 | .438 |
| "I think the use of immersive educational content (virtual reality) could help make the scientific, cultural, social, political, literary and other contributions of women more visible" (1-5) | 3.96 | 0.947 | 3.82 | 0.907 | 0.980 | 89 | .330 |
| "I would like to see more educational content in virtual reality that addresses gender | 3.40 | 1.089 | 3.47 | 1.019 | -0.397 | 89 | .692 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| issues" (1-5) | | | | | | | |
| "I think the use of educational content in virtual reality could help promote gender equality at school" (1-5) | 3.50 | 1.073 | 3.49 | 0.974 | 0.077 | 89 | .939 |

Souce: Prepared by authors

**Conclusions and discussion**

The analysis of the results of this study point to the following conclusions. In relation to the first objective set out in this study, the results obtained provide an insight into the technological context in which the secondary school students who took part in the study operate. It is clear that the aforementioned immersive technologies are not integrated within the educational context, revealing two problems: one affecting students' lack of knowledge of the devices, and the other linked to the immersive educational content available to teachers for use in the classroom. If these aspects are taken into account within the theoretical debate related to the concept of Education 4.0 (Miguélez-Juan et al., 2019; Ramírez-Montoya et al., 2022), it can be seen that the progress being made in this context is very slow in contrast to the rapid evolution associated with VR, AR and XR technologies. As a consequence, far from wanting to advance in an education where technologies and educational practices go hand in hand, a technological gap may arise that has a negative impact on both students and teachers when it comes to carrying out the teaching-learning process. These ideas in turn tie in with another theoretical debate that alludes to the potential of these technologies in the educational environment (Arevalillo-Herráez et al., 2023; Calderón et al., 2023). Although some of the literature highlights these potentialities, for example, from the point of view of the assimilation of concepts and the development of competences and skills by students (Espinoza et al., 2024), the reality studied leads us to reflect on the technological debate from the perspective of the real use of these technologies in the classroom by the different educational actors (Rodríguez & Paíno, 2022). As a result, this study highlights the importance of carrying out teaching practices within Secondary Schools linked to immersive technologies whose contents are perceived by students, not as something playful and entertaining, which is what they tend to associate it with, as reflected in the data obtained in this research, but rather as an approach where the value of the curricular contents transmitted by these technologies is prioritised (Sukhdeve, 2021; Tabash-Pérez & Sandoval-Poveda, 2021).

This study has been developed with the aim of advancing precisely this discussion. The main theoretical innovations associated with it are embodied in the prosocial concept, linked to the immersive contents that have been the protagonists of the experiment and which are related to the approach of the second and third specific objective. In this sense, the literature review shows a lack of content (Agurto-Cabrera & Guevara-Vizcaíno, 2023), especially when it comes to immersive educational resources aimed at addressing the gender perspective.

In this case, the object of study linked to the knowledge of some women with great contributions in different scientific areas through the correspondence they had with the famous writer Miguel de Unamuno in a 360º video format, and which have been used to carry out this research, have had a good acceptance from a

pedagogical point of view. They have helped the students surveyed to become more aware of the invisibility suffered by the women protagonists of the videos and their contributions and, as a result, most of them value the contributions of women in society more positively. On the other hand, it is striking in this respect that they do not consider that VR can be used to work on issues related to the gender perspective in the classroom, but although it is true, it should not be overlooked that the data oscillates more between the intermediate values than towards the extreme values, which could indicate a certain hesitation when it comes to choosing a response to the question.

This fact proposes new scientific approaches that allow progress to be made in the field of what, in this article, have been called Immersive Virtual Learning Environments (EVIA) and which could be used by producers when creating immersive content to be used in a truly immersive pedagogical experience.

Finally, and bearing in mind that this research focuses its object of study on students from a specific educational centre, it has certain limitations as it cannot be extrapolated to other contexts in other centres or academic stages; but it can be taken into account as a pilot experience that could be replicated, with certain adaptations, in other didactic spaces to continue advancing from a scientific point of view. This study could also be completed with the perspective that teachers can offer when using immersive technologies with a gender perspective in the classroom, in order to carry out a true evaluation of the entire process, both when learning (students) and teaching (teachers).

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