



Art Project Virtual Reality for Global Citizenship Education

Mariano Sanz-Prieto¹ · Gema De Pablo González² · Nuria De Pablo Sánchez³

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Abstract

The recent COVID-19 pandemic situation, where people's mobility has been reduced and compromised, has highlighted the need to acquire new technical skills and develop new educational plans that allow students to continue to enjoy different places and learn without having to move. In order to respond to this scenario, many schools are turning to *Virtual Reality* (VR) as a technology that allows students to experience a variety of experiences and destinations around the world without having to leave the classroom. Moreover, such technology can also be a way to better educate primary and secondary school students about the changing world we live in an innovative, modern and engaging way. The ART Project aims to connect VR methodology with global citizenship and arts education, thus enabling the online teaching of global citizenship, including art and culture, in an engaging and creative way. Specifically, the main objective is to offer a special training model that can guarantee access to art and culture through VR technology. In this article we present two main objectives derived from the project, which are to provide innovative global citizenship education to explore, discover and stimulate students' interest and to enable the possibility for teachers to contribute to the development of teaching materials and the presentation of this material on the platform.

Keywords Virtual Reality · Global citizenship · Art · Culture · Education

1 Introduction

For several years now, we have been living in a changing environment, in which *Information and Communication Technology* [ICT] has played a fundamental role. It is well known that the educational sector has been affected by this, especially in recent times when, as a

✉ Mariano Sanz-Prieto
mariano.sanz@uam.es

Gema De Pablo González
gema.depablo@uam.es

Nuria De Pablo Sánchez
ndepablo@siglo22.net

¹ Department of Pedagogy, Universidad Autónoma de Madrid, Madrid, Spain

² Department of Developmental Psychology, Universidad Autónoma de Madrid, Madrid, Spain

³ Fundación Siglo22, Madrid, Spain

result of the COVID-19 pandemic, educational centres have carried out rapid transformations in a very short time. This has meant a high level of demand in new and innovative technologies, such as VR (Mesa, 2021).

The social, cultural, economic and educational transformations that have resulted from the emergence of ICT has been greater in some contexts than in others. In educational environments, the ubiquity of learning has marked a crisis with respect to the value and mission of schools, which are still adapting. This has been exacerbated by the pandemic, limiting physical movements, thus forcing the current generation of learning environments to be ubiquitous, i.e. learning from home (Selwyn, 2020).

In addition, the emergence and use of ICT in the educational environment has enabled an even more profound transformation towards the elimination of communication barriers, as well as creating increasingly collaborative and horizontal environments (UNESCO, 2022).

In this article, we will discuss the Erasmus+Project *ART: Recorded for e-Ternity* [2020-1-NL01-KA227-SCH-083006], which uses VR to bring artistic and cultural knowledge into the classroom, thus fostering global citizenship in both primary and secondary school students. The consortium of this project is formed by partners from The Netherlands (ProWork, coordinator), Belgium (Artevelde Hogeschool), Italy (Sinergia Cooperativa), Czechia (Euroface Consulting) and Spain (Fundación Siglo22).

Prior to the pandemic situation, several schools had already started to adopt VR, but many more began to use it once the health crisis highlighted the need for new ways of teaching (Alnagrat et al., 2022).

VR allows students to experience a wide variety of situations from around the world without having to leave the classroom. This technology efficiently allows an approach to education for primary and secondary school students in a way that is adapted to the constantly changing world we live in (Sousa-Ferreira et al., 2021). Thus, the ART project aims to offer a special training model that can guarantee:

- The opportunity for students aged 8–16 to receive an innovative education in global citizenship (including art, culture, religion, among others), with the aim of exploring, discovering, and stimulating their interest in many areas.
- The option for teachers to contribute to the development of the teaching materials, and the presentation of these materials on the platform and through the VR glasses, in order to stimulate inclusiveness in education and being trained to do so.

In order to design the different learning materials contained in the platform, a *needs analysis* was carried out in each of the countries participating in the project. This analysis focused on the needs of teachers, education experts and ICT experts in all partner countries, as well as on the needs of students in relation to global citizenship and arts education.

2 Literature Review

2.1 The Virtual Reality

Before addressing the concept and justification for the use of VR in the classroom, it is important that we address a broader range of immersive technologies, which are devices

that provide sensory stimuli and provide a sense of realism and immersion in the user's computer-based interactions (Ryan et al., 2022).

According to Kovács et al. (2015), the more information channels we include in the education process, the better the learner's perception of the information, as recognised by psychology.

Thus, we can talk about different immersive technologies, related to visualisation, sound, smell and touch, the human senses (Ryan et al., 2022). In this sense, the most widely used are visual and auditory, perhaps because they are the best known, which should not make us forget the existence of others related to the rest of the senses. According to these authors, it is important to make them known in order to make the immersive experience more effective.

Amongst the visual technologies we can highlight: Augmented Reality (AR), an experience of interaction in a real environment in which objects are augmented by the perceptual information generated by the computer (Kovács et al., 2015); VR where an environment is created with real-looking objects or scenes in which one is allowed to be immersed in a very real way (Sánchez-Cabrero et al., 2019a, 2019b). Therefore, bringing global citizenship to students without leaving the classroom is now possible thanks to immersive technologies, in particular VR. The concept of VR was first defined by Sutherland, in 1965, as a window through which a person can perceive the virtual world as if it looks, feels and sounds real, and acts realistically (Cipreso et al., 2018).

It may come as a surprise that the first definition of VR is over half a century old. However, it is possible to establish an even earlier origin of VR as a theoretical conceptualisation, prior to that of computer science (although both concepts are closely related and one cannot be understood without the other). With the appearance of the first flight simulators in the 1930s, we can establish a first approach to VR. It was also in this decade that the concept of "Virtual Reality" was coined in Antonin Artaud's essay, "The Theatre and its Double" (Artaud, 1938/1958). Furthermore, it was in Stanley G. Weinbaum's (1935) science fiction short-story "Pygmalion's Glasses" that the first modern reference to VR was made (Sánchez-Cabrero et al., 2019a, 2019b).

All of this demonstrates a historic human need to create and experience *alternative* realities as opposed to just *physical* reality (Sánchez-Cabrero et al., 2019a, 2019b). Furthermore, it leads us to believe that this technology will not fall into disuse easily, as it generates the possibility of living experiences that bring us closer to historical and artistic events, places, facts, etc., beyond physical reality (Costa-Román, 2016; Sánchez-Cabrero et al., 2018). Being in an interactive simulation makes us feel that we are in front of a reality and not a simple animation. The fundamental feature that defines VR, as opposed to animation, is the ability to feel the exploration in real-time. This generates a true immersion, by directing the gaze and the direction of movement, losing the relationship with the external reality and generating, from different devices, an interaction with the elements that make up the virtual world scenario (Faller et al., 2017).

Although there are many definitions of VR, the three pillars that sustain it are realism, involvement and interactivity (Sousa Ferreira et al., 2021). Or, as expressed by Cipreso et al. (2018), it is characterised by three common elements: immersion, perception of being present in an environment, and interaction with that environment. This technology pursues the objective of approaching a reality from a fictional world by making the user the protagonist of the actions they are viewing, being able to interact directly (Domínguez-Martín, 2015).

According to Sherman and Graig (2019) cited in Sánchez-Cabrero et al. (2020), VR is based on five factors:

1. 3D graphics; which allow for a realistic perception of what you see through the VR glasses.
2. Stereoscopic techniques; which give realism and depth to three-dimensional images. This is achieved by "tricking" the mind into superimposing and creating the sensation of depth with two parallel images.
3. Behavioural simulation; this factor is constantly evolving, since the movements followed by the character with whom we interact are not predefined but improvised by the subject themselves.
4. Ease of navigation. by having more than one target and controller, the vision merges with the application in such a way that one must only worry about handling a certain control to perform a certain action. It is expected that the controls will become progressively more intuitive, and it will be very easy to navigate in these worlds, as we will develop natural movements.
5. Techniques for total immersion; VR glasses help to make the sense of immersion and parallel reality experienced as complete as possible. This is because they can produce isolation from the real world.

Because of all these factors, VR has an "advanced user interface" that involves visualisation and movement in three-dimensional environments and interaction with these in real time (Tori et al., 2006). This interaction can be through sight, sound, touch, taste or smell. For Cardoso et al. (2007), it is a computational system that allows the creation of artificial environments by the user. There are other definitions along the same lines, such as those of Dede et al. (2017) and Ancioto et al. (2018).

We cannot end this section without mentioning some of the difficulties in implementing the universal use of this technology, and virtual technologies in general, as the cost of the infrastructure is a major barrier to be considered. In addition, virtual education may limit students from interacting or generating cooperative learning situations (Garzozzi-Pincay et al., 2020).

2.2 Education for Global Citizenship in Times of Pandemic

Global citizenship education is a very relevant issue for today's societies, which are immersed in a changing world that requires responsible and collaborative actions (Santamaría-Cárdaba & Lourenço, 2021). As such, it is one of the UN's *Sustainable Development Goals* (United Nations, 2015), which insists on being able to address the development of a global citizenship that profoundly transforms our societies.

Given the recent events generated by the COVID-19 pandemic, and the crisis derived from this situation, humanity needs an integral and transdisciplinary perspective that addresses global health, based on an ethical-political-pedagogical practice (Boni et al., 2020).

With the outbreak of the health crisis, different initiatives and educational campaigns emerged, such as "Que lo Esencial Deje de Ser Invisible" (May the Essential Cease to be Invisible), promoted by CEIPAZ, the UNESCO Chair in Education for Social Justice, WILPF-Spain and the Fundación Cultura de Paz (2020). The aim which was to make citizen solidarity initiatives visible in order to respond to a situation as new and urgent as the aforementioned pandemic.

The beginning of this was characterised by the creation of links between people and various collectives in communities through cultural, artistic, educational, care, social economy

and sustainability initiatives (Mesa, 2021). All these initiatives were aimed at putting the focus on what is important, e.g. solidarity in the face of fear; the vulnerability of human beings. It is also very relevant to realise that in these first moments of the crisis, the initiatives and experiences were commonly based on the collective, dialogue, resilience, equity, creativity, etc., as essential values of society (Mesa, 2021).

After those early beginnings, we have to look at the results that have come out of that situation, such as the collapse of production and employment and the vulnerability of millions of people, in order to focus on prevention and learning. But the pandemic also created a very critical situation for schools and educational institutions. In July 2020, schools were still closed in more than 160 countries, affecting one billion students worldwide (United Nations, 2020). This situation was very serious, as education is the key to the development of societies, and is the tool to reduce inequalities (Bureau, 2021).

From this point of view, we must define what we mean by education for global citizenship, since if the pandemic has taught us anything, it is that we inhabit a global world that is increasingly interdependent. Thus, global citizenship is understood as a "critical social practice, which understands the curriculum as a cultural, ideological and social product that can be transformed" (Leivas & Boni, 2017, p. 45). It is, therefore, important for the future of sustainability in the world, that we address not only health crisis situations, but also other challenges that lie ahead. The aim is to train free and critical thinking citizens who promote an ethical and ideological assessment of the world, and who are able to project what they desire that world to be (Boni, 2014; Celorio & López de Munain, 2007).

2.3 VR as a Technological Response to Address Global Citizenship

How to educate for global citizenship in a world where mobility may be reduced? The COVID-19 pandemic generated the largest experiment in distance education in history, positioning a multitude of schools to face the challenge of continuing to teach in a totally different context to the one they had known (Ibáñez, 2021). It is true that all schools quickly took steps to respond to the situation by going "digital". However, the results were not what might have been expected and did not meet the required standards. A recent report shows that there was a high cost to learning, especially for the most vulnerable pupils, exacerbating educational inequalities. Technologies were used, especially in terms of digital channels to connect, but less was done in terms of learning plans which took into account these channels (Chen et al., 2021).

The debate on whether technologies in themselves bring about improvements in education is an old one. A school cannot function without technology, but it is important that it makes sense and serves the learning objectives (Ibáñez, 2021).

On the road to global citizenship education, bridging existing gaps and generating a global response to inequality, we find that certain technologies can help to enhance that. In a pandemic situation where mobility is compromised, VR can alleviate these difficulties, as it is a technology that facilitates the creation of synthetic realities with which to interact and feel physically present (Botella et al., 2009). Moreover, in situations of vulnerability, bringing culture and art closer as manifestations of such citizenship can generate a rapprochement between the different realities of our society. According to the Monterrey Institute of Technology and Higher Education, VR can take students to places where they do not have access, carry out practices in a controlled space and minimise risk, as well as facilitate the understanding of abstract or more difficult concepts (Rodríguez & Aldape, 2021).

The scientific and technological advances, as well as the trajectory of this technology, make us think about the promising future of VR. It can bring out the creative and cognitive capacities of the user, who can develop sensory environments that are more indistinguishable to the five senses (Pérez-Martínez, 2011; Rizzo & Koenig, 2017). This opens up a new world of opportunity, positioning this technology as an ally in the development of an education for global citizenship, with culture and art as the pillars of learning.

3 Research Questions

The aforementioned studies suggest that the use of VR in the classroom can educate for global citizenship, bringing artistic and cultural manifestations from different places closer. As such, the students feel as though they are travelling to those places, which contributes to their learning. This project aims to provide an innovative education on global citizenship (including art, culture, religion, etc.), with the objective of exploring, discovering and stimulating their interest in many areas. It also allows the possibility for teachers/educators to contribute to the development of teaching materials and the presentation of this material on the platform.

Derived from these objectives, we ask ourselves two questions to which we will respond in this article:

What is the status of the concept of European global citizenship amongst students in the countries participating in this project?

How can VR help to improve and enhance global citizenship education?

4 Methodology

4.1 Design of the Investigation

The research design methodology was both qualitative and quantitative. On one level, a thematic analysis was applied to the qualitative data obtained from the expert focus groups. On another, descriptive statistics were applied to quantitative data obtained from the questionnaires.

Specifically, the project team designed two complementary actions: Firstly, a Needs Analysis was created and carried out by means of a thematic analysis:

- A discussion group with experts to lay the groundwork for the materials to be developed during the course of the project. The expert group would discuss the possibilities of VR in education and the possibilities of the project. Both a discussion via one of the European Commission's digital platforms, *Electronic Platform for Adult Learning in Europe* [EPALE] and a *needs analysis* survey were carried out.
- The second element of the study consists of a *needs analysis* survey, containing 25 questions about teachers' perception and knowledge of VR. The survey was created using SurveyMonkey and translated into all partners' languages. It was completed by 131 teachers (primary and secondary education).

In addition, two questionnaires were designed (one for primary schools and the other for secondary) on aspects of global citizenship which were answered by students from the

participating countries. The questionnaires addressed different issues about what kind of global citizenship education they are receiving or have received in school, with a special emphasis on a European level.

This data is important to be able to make decisions on which learning materials will be developed. As this is an ongoing project, data has not yet been collected on the impact that the use of VR materials can have on the development of global citizenship education. At the end of the project, the same questionnaire will be administered again to assess whether there are any changes in the responses after testing the project materials, i.e. the immersive experience through the VR glasses.

4.2 Participants

The choice of the sample was made according to the parameters established in the project, where each country carries out the pilot project in schools in the countries willing to participate. The initial objective of the project was to reach at least 25 teachers and 500 students, but final figures were bigger, though there was no obligation for teachers or schools, and participation in the project was voluntary.

The needs analysis started with the discussion of 27 experts, from all the countries of the project, which was held in the digital platform EPALE. They were asked different questions related to VR and the possibility of implementing VR in education. Furthermore, the questionnaire about teachers’ perception and knowledge of VR was answered by 131 primary and secondary school teachers from all the partner countries.

The students’ questionnaire on global citizenship was answered by a total of 670 students in primary and secondary education from all partnering countries. As can be seen in Table 1

If we considered the sex of the students, 399 answers were male, and the other 271 were female.

4.3 Procedure

First, a panel discussion was held via the digital platform, EPALE, where questions were asked about the educational potential of VR; how educational actors may use it; and how to create materials for VR.

The second element of the study, a *needs analysis* survey with 25 questions on teachers’ perception and knowledge of VR, consisted of three sections:

- The first section aims to obtain personal information from teachers, such as country of residence; gender; teaching level; years of experience and experience with technology and VR.

Table 1 Number of Answers by Country and Studies Level

	Belgium	Czek Rep	Italy	Spain	The Netherlands	Total
Primary	103	12	81	0	33	229
Secondary	97	97	173	63	11	441
Total	200	109	254	63	44	670

- The second section focuses on obtaining detailed information about each teacher's school context, with questions about use of VR in their schools; sufficient equipment of VR resources and materials; teacher training; feasibility of VR implementation, and their own knowledge about VR.
- The third section focuses on obtaining information about these teachers' opinions on the usefulness of VR; its benefits and disadvantages; the areas in which it could be implemented; the different educational content and educational needs it could address; and the types of virtual places they would like to see created with VR. This section also aims to find out whether these teachers would like to increase their knowledge on VR and whether they think they would implement this type of resource in their future lessons.

The teachers' questionnaires were prepared by Siglo22 researchers, in order to feed the needs analysis report, and it was validated by two teachers of the Autonomous University of Madrid, and one from the Malaga University, all of them from Education Faculties. They also validated the students' questionnaires, prepared by Artevelde Hogeschool researchers with previous UNESCO test as the initial base, and they were validated, apart from the three Spanish University teachers already mentioned, by two primary and two secondary school teachers in Belgium to be sure students will understand them.

With regard to these student questionnaires, they were designed on the basis of several sections:

- A section on how the pupil behaves as an individual in situations of opinion generation, interaction in debates, conflict resolution and problem solving, among others.
- A second section on the pupil in relation to others, with questions about whether the pupil is in contact with people from different cultures, or about their interest in learning about other countries, religions, among other things.
- A third section about how the pupil sees themselves in relation to their place in the world, with questions related to knowledge about current issues and their degree of felt responsibility with respect to them.

5 Materials

As mentioned above, the European Commission's digital platform, EPALE, was used for the discussion amongst experts in the first phase of the *needs analysis*, as this platform allows this type of discussion to take place. SurveyMonkey was used for the teacher questionnaires. In addition, a tool developed by one of the project partners was used to carry out the student questionnaires.

The creation of virtual tours, including the educational content, were carried out using the CMS called *Virtual Reality Educative* [VRED]. It allows educators of museums and educational organizations to create, manage and administer educational content in their own 'VR tour' and changes in the CMS are immediately online. Concerning the educational items that may be included in the tours, this software is able to manage five different types of media: a fact/text; an image (JPEG, PNG, RAW); a video-file (MP4, YouTube-link); an audio-file (MP3, FLAC, AAC); a question (multiple-choice and open questions), and in Fig. 1 it is shown how it looks and how the educational content can be accessed.

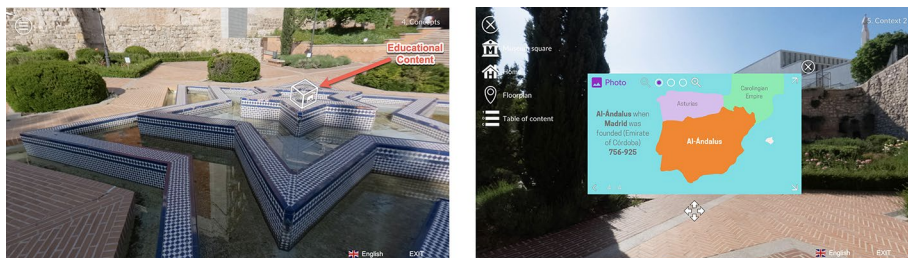


Fig. 1 Example of how to access educational content in the system

The 360° images were created using a Ricoh Theta Z1 camera and managed using their own stitching software together with photoshop. As to the VR glasses, what they used was PICO G2 4 K.

Based on the results, a didactic guide for the creation of materials with the VRED software is developed. The VR-Software allows to add an interactive cube to every virtual environment with the items mentioned above. By interacting with the cube, the students get access to questions and information. Another useful application is *Storytelling*, also known as *Docufiction*. It has been proven that a combination of both historical facts with narrative fiction leads to an increase in both learning potential and engagement with the students (Vanoverschelde, 2019). The focus of *Storytelling* is, therefore, to increase the students' immersion and, equally, their empathy. This is achieved by linking the lesson materials and VR-environment to fictional and non-fictional narratives. While the story may be fictional, it is important that both the setting and facts remain grounded in what is reality and what is factual.

6 Results

6.1 Epale Discussion

The Epale discussion provided the project consortium with a clear picture of the views of the people involved. Below are some of the most relevant answers from the 27 Virtual Reality experts who participated in the EPAL discussion:

6.1.1 What is VR Technology and How Does It Contribute to Innovation in Education?

Regarding this question, 20 of the experts interviewed shared the idea that VR can be a useful tool both in the classroom and in e-learning contexts. According to a Primary School teacher 1 in Bari (Italy), thanks to Virtual Reality, “*children can discover elements of the real world in a whole new way, not simply by looking at an image printed on a book*” and it also encourages “*greater emotional involvement than traditional lessons*”.

This new way of experiencing the world will drastically change the current educational approach allowing students to feel the “*presence and immersion as if it were real and is able to interact with the environment in a way as natural as technology allows*” (Expert 1 from Spain).

VR will expand education outside school walls, making it possible to access every imaginable topic or element and “*to enable students to experience practical situations in a safe and accessible way*” (Expert 1 from The Netherlands). As it is stated by Expert 2 from The Netherlands, thanks to this VR, children can experience places or objects that they might never see otherwise. VR will make all these elements more visual, and will make it possible to perform different activities such as “*taking a walk on the moon, crawling into the cell structure of a plant...*” (Expert 1 from Belgium) or to explore a wide range of scenarios, especially art-related ones. Therefore, thanks to VR, students could “*travel to the Cathedral of San Pedro de Jaca (Huesca) or even to the Cathedral of Bamberg, in Germany, where you can see that the cathedral contains a mixture of Romanesque and Gothic styles, almost touching each brick of its wall*”. (Expert 2 from Spain).

Moreover, VR would also put an end to economic or any other kind of inequalities regarding the access to these experiences abroad, since any kind of trip would be “*possible both for the wealthy boy and for the one who has unemployed parents, both for those who can move freely and for those who, for different reasons, cannot do it*” (Expert 2 from Italy). Thanks to VR, students could also experience the past and learn different events of the past in a more dynamic and attractive way.

Apart from that, VR could also help students in many other fields, as it could be “*definitely good as an aid to geography, history, science or language teaching*” (Expert 1 from Czechia). VR could be also a good aid in math lessons, since, for example, as it is stated by Expert 2 from Czechia, “*geometry in space is an extremely demanding subject—especially for students who have less imagination—here they can “see” what the task looks like in “reality” and find their own way to “generalize” “converting 3D to 2D”*”.

This, according to the experts, could be very useful in situations similar to what happened during the COVID-19 lockdown, allowing students to continue learning outside school and enjoying the previously mentioned environments.

Another interesting aspect mentioned by Expert 2 from Czechia was the fact that the use of VR reality will reduce museums’ problems related to accessibility, “*both financially as well as simply the existence of stairs in the old building*”.

6.1.2 How can Students, Teachers and Other Experts and the Professional Education Field be Involved in This?

21 of the experts agreed that teachers and students should play a key role when implementing VR into the educational sector.

With respect to teachers, 23 of the experts claimed that they should have a fundamental role in creating and assisting VR content. For instance, they “*can map out where, when and how VR can offer added value and which learning goals can be achieved (more) efficiently*” (Expert 2, Belgium). Moreover, as it was also stated by 12 experts, teachers will also have to get used to working with and using VR in the classroom, in order to enjoy all of its benefits, and to implement it correctly. As they will be the guides, they will be responsible for the students’ learning process, ranging this responsibility “*from the creation and selection of contents, to their usability and effectiveness*” as well as the “*teaching the methods of use, the potential and limits of the devices and technologies used*” (Expert 3, Italy).

With respect to students, they “*can play a meaningful role in an (probably) extensive testing phase, with a view to optimizing the use of VR and with a view to drawing up a kind of user manual for the target audience*” (Expert 3, Belgium). Apparently, children will experience no problems when using Virtual Reality, since “*new generations grow up*

in a world where technologies are a means of communication and information used in most daily activities” (Expert 4, Italy). All these VR experiences will drastically change the traditional perception of education, making students the main protagonists of the educational process, since they can “*(co-)steer this themselves*” and would be able to “*determine themselves and on the basis of their own preferences and interests what they encounter on their learning path*” therefore, “*taking control of the teaching themselves, which can lead to greater involvement*” (Expert 3, Belgium).

6.1.3 How Can Publicly Accessible Material for the VR Application be Developed that Does Not Infringe Copyrights? How can we Deal with Permission from Museum?

This question was hardly answered by any of the experts; only 3 of them participating in the discussion. Moreover, some of the experts that answered agreed that this is a difficult topic.

In order to face this big challenge of using specific resources and materials, Expert 1 (Germany) stated that “*politics need to step in to solve these copyright issues and help push education forward*”. Additionally, we should also work to make this technology more attractive “*for politicians and companies to jump on the educational train and develop and invest in this area*”.

6.1.4 What can VR mean in a traditional learning context, for example in a blending learning and/or co-creation context or in distance learning?

20 of the experts asked, agreed that VR can be a useful resource in every single context, just paying attention to the different learning levels or groups we wish to implement it at.

As it has been mentioned before, VR could be a great resource that would definitely enrich the learning process. For example, Expert 2 (Germany) establishes that “*even in traditional face to face learning those experiences can create more meaningful learning experiences*”.

Those benefits could also be seen in different educational contexts, such as blended or distance learning. For instance, “*in blended or virtual learning VR can be an additional stimulus for students, paying attention also to the emotional aspect of the experience, with a motivational setting of the virtual classroom*” (Expert 1, Italy).

Moreover, as it has previously been mentioned, the use of VR in distance learning can be a good means to explore the world from our own houses, since “*places or objects are now accessible that might otherwise never be seen by children*” (Expert 2, The Netherlands).

6.1.5 How does the Educational Material Fit in a Context with Different Types of Students (Levels) from Different Countries?

As 9 of the experts explained, nowadays, the implementation of VR within the educational context should not be a problem, due to students’ familiarity with different educational technologies.

The material created, as 22 of the experts suggested, should be developed paying attention to the different students’ skills and capabilities. In order to successfully achieve this, teachers must play a crucial role, since “*they know the attitudes and aptitudes of their pupils, their school and their country*” and would be able to adapt “*these materials to the*

different levels, taking into account all the other factors that may intervene in the process" (Expert 2, Spain). Also, other experts suggest that these VR resources could be used in every single country, because *"there are contents and disciplinary knowledge that are universal and compulsory in all school curricula"*. This would only involve adapting *"adapt each material to the different languages and then a socio-cultural adaptation in those that are required"* (Expert 1, Mexico).

6.1.6 What are the Possible Pitfalls and What Solutions Within the Implementation in this Project?

As it has been stated before, 23 of the experts decided that the main benefits of VR are related to the wide range of content and topics it can cover, and with the improvement of students' motivation and engagement due to its more practical features.

Considering the potential disadvantages that could be experienced when implementing VR in the educational context, the financial issue was the most recurring problem that experts cited. The different materials and resources needed to be produced, and the necessary equipment that should be acquired, can be expensive and sometimes unaffordable for some schools and educational institutions.

Another problem addressed was the fact that these resources promote a very individual learning experience, making it *"difficult to get an entire group into the same learning context"* (Expert 2, Belgium).

Teacher training is an aspect that must be taken into account, since teachers play a vital role in the implementation of these kinds of resources within the classroom. However, as mentioned by Expert 3 (Italy), there is sometimes *"certain resistance to innovative teaching by a large part of the school teaching staff"*.

6.2 Teachers' Questionnaire

The survey was sent by project partners to primary and secondary school teachers from their own countries. Answering was voluntary. The number of teachers who started the survey was 131, but the number of teachers who completed it was 116. Specifically, 40.52% of the teachers who responded to the survey were from primary education and 41.38% from secondary education. Of these teachers, 18.1% indicated that they belonged to another educational level, such as higher education or vocational education and training.

Regarding the gender of these teachers, 30.17% were male and 69.83% were female. The experience of these teachers in the field of education seems to be quite varied, as 31.9% of them have no more than 5 years of experience, 19.83% have 5 to 10 years of experience, 16.38% have 10 to 15 years of experience, 12.07% have 15 to 20 years of experience, and 19.83% have more than 20 years of experience.

Regarding the level of use of technology in teaching, it could be said that most of the teachers who responded to the survey felt familiar and comfortable with its use. On a scale of 1 to 6 (1 meaning very basic knowledge and 6 meaning high knowledge), the average response was 4. However, when it came to their experience in using VR, the answers obtained were not so high-scoring. Specifically, 42.24% of these teachers stated that they *had used* VR, while 57.76% of them indicated that they had *never* used it. The results obtained from the responses of the Belgian, Dutch and Spanish teachers were very significant, as only 16.67% of the Belgian teachers, 31.58% of the Dutch teachers and 29.17% of the Spanish teachers said that they had used VR before. By contrast, this percentage was

higher in Czechia and Italy, where 61.9% of Czech teachers and 52.63% of Italian teachers claimed to have used VR before.

The following Fig. 2 shows the results for the first section of the survey.

Concerning the use at school (Sect. 2 of the survey), the results showed that most of these teachers did not find it easy to use VR: 21.55% of them stated that they found VR *very difficult*, and 38.79% of them indicated that they found it *difficult*, making a total of more than 60% of teachers having difficulties in using VR.

The results are even less promising when asked whether their schools use VR frequently: 73.28% of these teachers (86.67% in Belgium, 76.19% in Czechia, 79.17% in Spain, 68.42% in the Netherlands and 47.37% in Italy) indicated that their school has *never* used VR, and 20.69% of them stated that their school has *hardly* used VR at all. Only 3.45% of these teachers' schools use VR *sometimes* and 2.59% state they do so *very often*.

In addition, when asked whether their schools were well equipped, the results were not so positive either: 62.93% of the teachers indicated that their schools were *not equipped* at all with VR materials and 23.28% of these schools were *poorly equipped*. These results are in line with the responses obtained in the EPALE discussion, where experts stated that this problem could be related to financial issues, as this equipment can be expensive and sometimes unaffordable for some schools or educational institutions.

These teachers also indicated that school staff are not well trained to use VR: 72.41% of them indicated that staff are *not trained* at all (96.67% in Belgium and 80.95% in Czechia) and 22.41% of them indicated that staff were *poorly trained*. These two percentages make a total of almost 95% of responses, indicating that staff are not very well trained in the field of VR.

When talking about their personal competences, although the results were not positive either, the respondents seemed a bit more confident about their training in VR: 47.41% of these teachers felt that they were *not trained* at all to use VR, whilst 29.31% felt they had *very little knowledge* related to VR. However, the perception of these teachers about the possibility of applying VR activities in the classroom seems to be more promising. Almost 10% of the surveyed teachers indicated that it would *not be feasible at all* to implement VR in the classroom, whilst 50% of them stated that it would *not be very feasible* to implement it. On the contrary, 30.17% of these teachers indicated that it *would be feasible* to implement VR, and 10.34% of them indicated that it would be *very feasible*.

The following Fig. 3 shows the results of the second section of the survey.

Gender			Years of experience		
Answer Choices	Responses		Answer Choices	Responses	
Male	30,17%	35	0 - 5	31,90%	37
Female	69,83%	81	5 - 10	19,83%	23
Rather not to say	0,00%	0	10 - 15	16,38%	19
Other	0,00%	0	15 - 20	12,07%	14
	Answered	116	+ 20	19,83%	23
			Answered		116
Level you teach			Have you ever tried Virtual Reality?		
Answer Choices	Responses		Answer Choices	Responses	
Primary Education	40,52%	47	Yes	42,24%	49
Secondary Education	41,38%	48	No	57,76%	67
Other (specify)	18,10%	21			
	Answered	116	Answered		116

Fig. 2 Review of Sect. 1, Personal Information of the teachers' survey

How easy is Virtual Reality to use?			Does your school use VR frequently?		
Answer Choices	Responses		Answer Choices	Responses	
Very difficult	21,55%	25	Never	73,28%	85
Difficult	38,79%	45	Hardly Ever	20,69%	24
Easy	32,76%	38	Sometimes	3,45%	4
Very easy	6,90%	8	Very Often	2,59%	3
Answered		116	Answered		116
Is your school well-equipped and does it have the necessary resources and materials to use VR?			Is the staff well trained in the field of VR?		
Answer Choices	Responses		Answer Choices	Responses	
Not at all	62,93%	73	Not at all	72,41%	84
Poorly equipped	23,28%	27	Poorly trained	22,41%	26
Equipped	10,34%	12	Trained	4,31%	5
Well equipped	3,45%	4	Well trained	0,86%	1
Answered		116	Answered		116
How feasible would it be to implement Virtual Reality activities in the classroom?			Do you think you have the necessary knowledge to use VR in the classroom?		
Answer Choices	Responses		Answer Choices	Responses	
Not feasible at all	9,48%	11	Not at all	47,41%	55
Not very feasible	50,00%	58	Little knowledge	29,31%	34
Feasible	30,17%	35	Good knowledge	13,79%	16
Very feasible	10,34%	12	Very good knowledge	9,48%	11
Answered		116	Answered		116

Fig. 3 Review of Sect. 2, At School, of the teachers' survey

Entering in the VR Experience (Sect. 3 of the survey), shows that, contrary to the negative results obtained in the previous questions, when asked about how useful they think VR is, 42.24% of these teachers indicated that it is *useful* and 41.38% of them indicated that it is *very useful*.

In addition, some teachers highlighted some advantages, such as its modern and engaging approach, which could make lessons more interesting and allow students to experience environments and elements they might not otherwise experience.

Teachers were also asked whether they agreed or disagreed with specific statements related to precise benefits of using VR. The first of these statements seeks to test whether VR can increase students' motivation to learn new concepts and topics. Only 1.72% of these teachers *strongly disagreed* and 3.45% of them *disagreed* with the statement. However, 25.86% of them *agreed* and 68.97% *strongly agreed* with the statement.

The second statement aims to test the teachers' perception of whether VR can increase students' understanding of the different concepts studied. Only 0.86% of the teachers who completed the survey *strongly disagreed* and 6.9% *disagreed* with the statement. In contrast, 33.62% of these teachers *agreed* and 58.62% *strongly agreed* with the statement.

Finally, the third of these statements was to test whether VR can give pupils a better understanding of the world around them: 2.59% of these teachers *strongly disagreed* and 7.76% *disagreed* with the statement, while 33.62% of them *agreed* and 56.03% *strongly agreed* with it.

These positive results obtained from the above three statements conclusively show us that teachers are aware of the benefits of VR.

Teachers were also asked about the possible disadvantages of using VR. In this regard, some teachers added different disadvantages, such as the fact that this technology might require a lot of work and maintenance, and that it might become obsolete quickly. In addition, others pointed out that there might be some teachers who are not open to learning new methodologies.

Teachers were also asked which areas or subjects they thought would benefit most from the implementation of VR activities. The most selected areas/subjects were Arts (65.52%), Natural Sciences (66.38%), History (79.31%) and Geography (81.9%). Other teachers also mentioned the possibility of VR being used in Music Education, Social Sciences, Physics and Second Language classes.

As mentioned above, the experts who participated in the EPALE discussion and the teachers who completed the survey affirmed that VR offers several advantages. Moreover, some of these benefits could be related to the development of a wide range of educational needs. Teachers were also asked which of the mentioned educational needs they thought VR could help to develop.

From the results obtained, problem solving skills were the most selected educational need (71.55%), followed by teamwork (51.72%) and communication skills (48.28%). Apart from the given options, some teachers also added several educational needs, such as creativity and global experience.

The next question in the survey focused on the elements or themes that these teachers would like to see implemented in their subjects. These teachers indicated a wide variety of elements, such as different historical and musical periods; topics related to religion; environmental and digital ethics; grammar; literary works; mathematical problems; physical phenomena; the human body; components of computers or machines; mechanics; volcanic eruptions; simulation of meteorological phenomena; landscape formation; ecosystems or landscapes, such as the underwater world; natural parks or polar regions; the origin of the universe; the internal geology of the planet; plant photosynthesis; spatial models of atoms; the Solar System; driving directions; the representation of children's books; and current problems, such as xenophobia; discrimination; dissidence; gender issues, etc.

In the next question, teachers were asked to select which of the given locations they would like to see implemented using VR. Most of them indicated museums (84.48%), historical buildings (75.86%) and monuments (63.79%) would be the most suitable elements to be implemented using VR.

When asked to specify some of these places in the next question, teachers provided a wide variety of places and buildings. For example, they mentioned some monuments, such as the Eiffel Tower; museums and galleries, such as some National Museums, the Vatican Museum (Vatican City), the Vittoriano Museum (Italy), the Jatta Museum (Italy), the Rijksmuseum (Netherlands), Wereldmuseum (Netherlands), the Louvre (France), the Prado Museum (Spain) and the Thyssen Museum (Spain).

The following Fig. 4 shows results for the third section of the survey.

6.3 Student Questionnaire on Global Citizenship

With respect to the questionnaires which were administered to primary and secondary school students, the most relevant results of both are shown below, due to the length of the questionnaire.

How useful do you think VR is?			How useful do you think VR is?		
Answer Choices	Responses		Answer Choices	Responses	
Not useful at all	1,72%	2	I strongly disagree	2,59%	3
Not usefull	14,66%	17	Little agreement	7,76%	9
Useful	42,24%	49	Somewhat agree	33,62%	39
Very useful	41,38%	48	I agree	56,03%	65
		Answered			Answered
		116			116
Virtual reality can increase students' motivation to learn new concepts and topics.			Virtual reality can increase students' understanding of the different concepts studied.		
Answer Choices	Responses		Answer Choices	Responses	
I strongly disagree	1,72%	2	I strongly disagree	0,86%	1
Little agreement	3,45%	4	Little agreement	6,90%	8
Somewhat agree	25,86%	30	Somewhat agree	33,62%	39
I agree	68,97%	80	I agree	58,62%	68
		Answered			Answered
		116			116
In your opinion, which areas or subjects would benefit most from implementing VR activities?			What educational needs would you like to see met through the implementation of VR activities?		
Answer Choices	Responses		Answer Choices	Responses	
Language	12,93%	15	Leadership skills	8,62%	10
Mathematics	15,52%	18	Teamwork	51,72%	60
Natural Sciences	66,38%	77	Communication skills	48,28%	56
History	79,31%	92	Problem-solving skills	71,55%	83
Geography	81,90%	95	Work Ethic	13,79%	16
Arts	65,52%	76	Flexibility	34,48%	40
Technology	50,00%	58	Interpersonal skills	35,34%	41
Other (specify)	14,66%	17	Other (specify)	12,07%	14
		Answered			Answered
		116			116

Fig. 4 Review of Sect. 3, VR Experience, of the teachers' survey

In the first block of questions, on how the student behaves as an individual in situations of opinion generation, interaction in debates, conflict resolution and problem solving, we can see the following results.

Question 1: Having an opinion and sharing it.

As can be seen in Fig. 5, almost the 48% think that *is important, and I can form my own opinion*. Whereas, almost 40% of the responses think that *is important, but I don't always know how to share my opinion*.

The results indicate that most of the students find it important to be able to form their own opinion, and almost half of them feel sure of being able to have their own opinion on things.

Question 2: At school we learn how to properly from and share our own opinion.

Question 9: In school we learn how to resolve conflicts.

Question 11: Working together with others (friends, classmates...) can help when resolving problems

We have grouped the responses with respect to these three questions, as they address similar issues of conflict resolution and the role the school plays in it. They can be seen in Fig. 6.

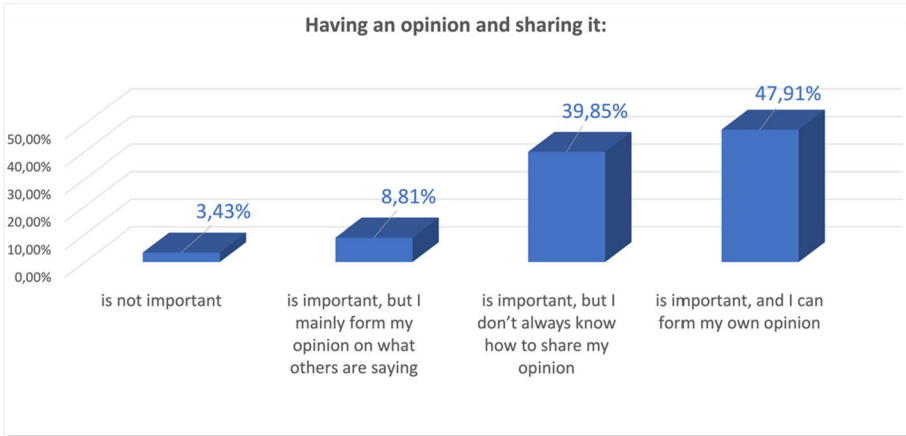


Fig. 5 Having an opinion and sharing it

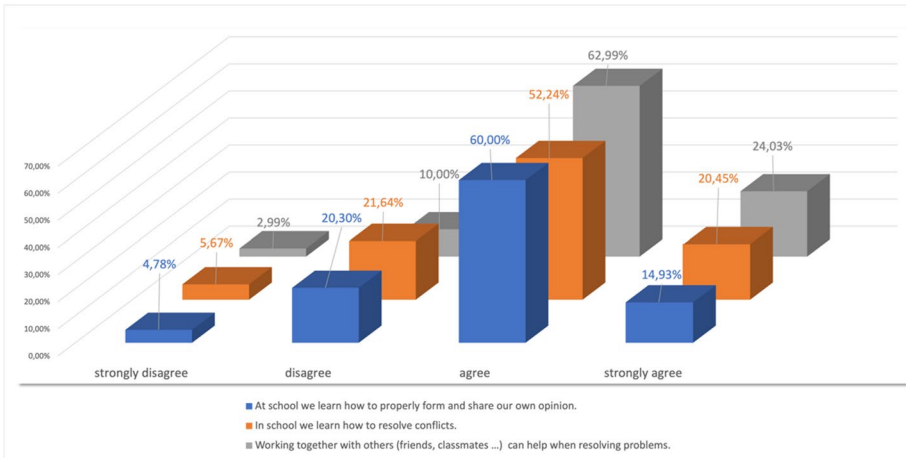


Fig. 6 Learning to have an own opinion and resolve conflicts

Concerning if schools teach properly to form their own opinion, 74.93% thinks they do, such as their opinion on how they learn to resolve conflicts (72.69%), though the number of them who does strongly agree with this statement is almost 6% higher. The most obvious finding from the question, is that most students believe that working with friends and classmates will help to resolve conflicts, as 87.02% agreed with the statement.

Question 5: Whenever I criticize someone, I try to empathise with them

As we can see in Fig. 7, when asked whether they are able to empathise with a person even if they disagree with them, 44.03% *often* think that, 32.09% *sometimes* think that, and only 16.42% *always* think that. Only 7.46% *never* think that way.

Question 6: Whenever I see a new article on social media, I ...

In this question, the pupils were asked about their behaviour when they see news on social media. As shown in Fig. 8, only 8.21% believe it and do not doubt any further. 15.37% say they do not immediately believe it without looking up more information.

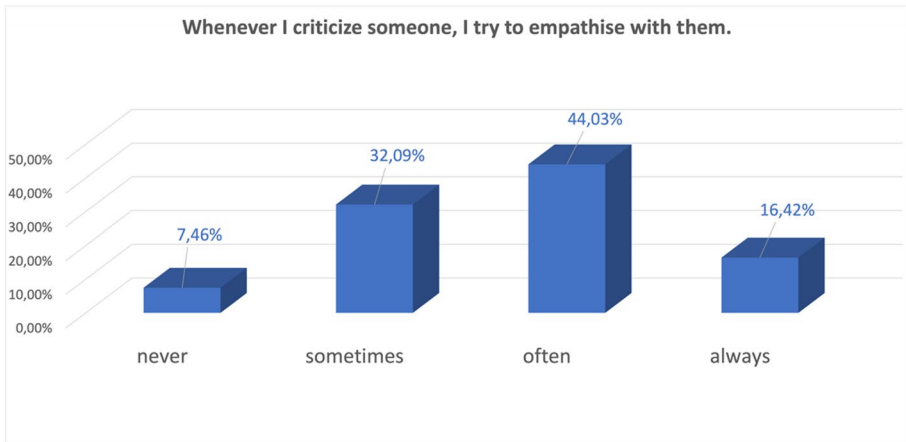


Fig. 7 Level of perceived empathy

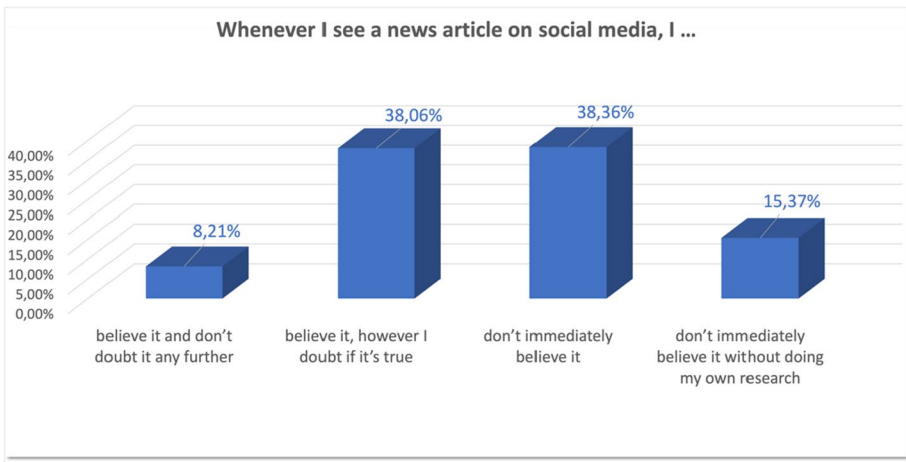


Fig. 8 Level of trust in the accuracy of news on social networks

These two responses formed the lowest percentage of the results. By contrast, 38.06% believe the articles, although they doubt whether they are true, and 38.36% do not believe them immediately.

The number and percentage of answers in this section is summarized in the following Table 2.

With regards to the second block of questions, which referred to how the pupil perceives themselves in relation to others, with questions about whether they are in contact with people from different cultures, or are interested in getting to know other countries, religions, etc., we analysed the following questions.

Question 13: Check the answer that suits you best (I see myself as an inhabitant of my village/town; I see myself as an inhabitant of my country; I see myself as European; I see myself as a world-citizen).

Table 2 Number and percentage of answers in section “Me as a person”

Me as a person	1	2	3	4	Total
<i>Q1</i>					
#Answers	23	59	267	321	670
%	3.43	8.81	39.85	47.91	100
<i>Q2</i>					
#Answers	32	136	402	100	670
%	4.78	20.30	60.00	14.93	100
<i>Q5</i>					
#Answers	50	215	295	110	670
%	7.46	32.09	44.03	16.42	100
<i>Q6</i>					
#Answers	55	255	257	103	670
%	8.21	38.06	38.36	15.37	100
<i>Q9</i>					
#Answers	38	145	350	137	670
%	5.67	21.64	52.24	20.45	100

As we can see in Fig. 9, at a global level, the majority of students respond that they identify themselves as citizens of their country with 33.88%. This is followed by 28.96% who identify themselves as citizens of the world, 20.30% who identify themselves as inhabitants of their town or city and 16.87% who identify themselves as Europeans.

If we look at the differences between countries, the case of Spain is particularly striking, where we can see that none of them feel European (0.0%), followed by the Netherlands with 6.8% on this item. However, we can also see that 38.10% of Spaniards feel that they are citizens of the world. Czechia also stands out in the item on Europe, with 46.79% feeling European.

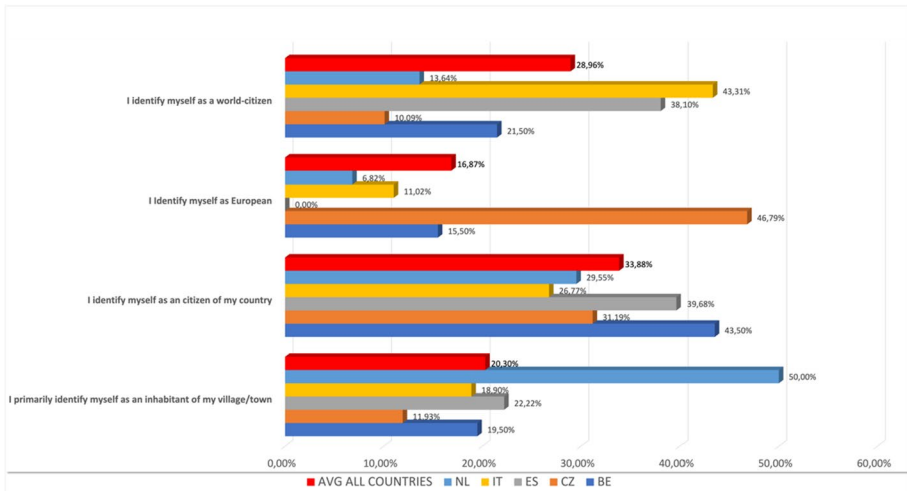


Fig. 9 Level of perception of themselves with a concrete place

Question 14 to question 18: several questions about other countries and cultures (I'm interested in art that was made in other countries; I'm interested in the history of other countries; I'm interested in how people from other countries look at the world; I want to learn more about other religions; I want to learn more about how people live in other countries/cultures).

We have grouped these questions together because it is interesting to see the differences between them, as they deal with the same concept regarding their interest in other cultures. Thus, we can see that, in general, there is quite a lot of interest in learning about the history, art and religion of other countries.

It is particularly noteworthy that 38.96% are *interested* in learning about other religions, and 27.46% are *quite interested* in learning about other religions. 38.36% are *quite interested* in finding out how people live in other countries. Also 37.01% and 35.82% find *it quite interesting* how they look at the world in other countries, and what is the history of other countries, respectively.

We can also see in Fig. 10, that there is a minority who have no interest in any of the items asked.

The number and percentage of answers in this section is summarised in the following Table 3

Finally, with regards to the third section where they were asked about how the pupil sees themselves in relation to their place in the world, with questions related to knowledge about current issues and their degree of responsibility for them. With respect to the results, we can see the comparison between the following questions:

Question 22: I inform myself on societal topics (e.g. racism, poverty, climate change, international conflicts, inequality between men and women, gender wage-gap ...) via the news, newspapers, websites and/or social media.

Question 23: I feel responsible to do something about issues in the media (e.g. racism, poverty, climate change, international conflicts, inequality between men and women ...).

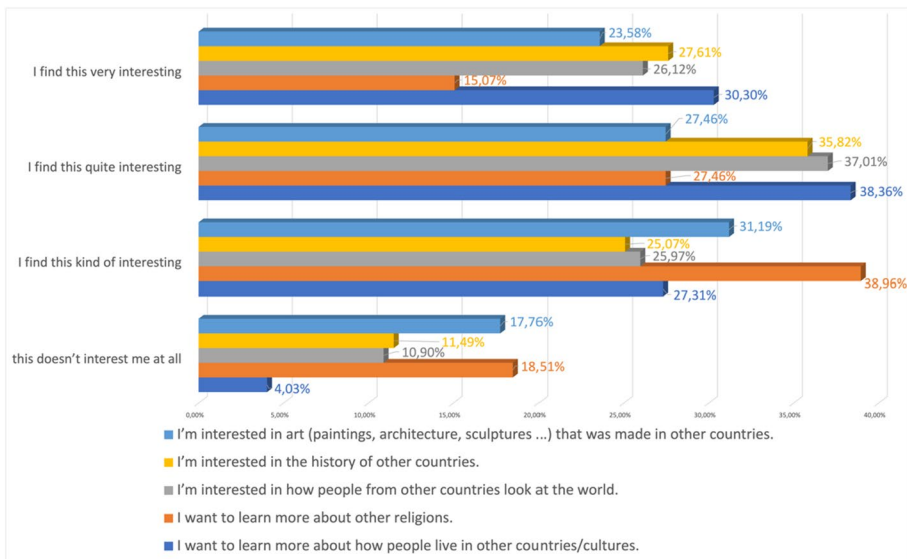


Fig. 10 Interest in learning about other cultures and religions

Table 3 Number and percentage of answers in section “Me and my relation with others”

Me and my relation with others	1	2	3	4	Total
<i>Q13</i>					
#Answers	136	227	113	194	670
%	20.30	33.88	16.87	28.96	100
<i>Q14</i>					
#Answers	27	183	257	203	670
%	4.03	27.31	38.36	30.30	100
<i>Q15</i>					
#Answers	124	261	184	101	670
%	18.51	38.96	27.46	15.07	100
<i>Q16</i>					
#Answers	73	174	248	175	670
%	10.90%	25.97%	37.01%	26.12%	100%
<i>Q17</i>					
#Answers	77	168	240	185	670
%	11.49	25.07	35.82	27.61	100
<i>Q18</i>					
#Answers	119	209	184	158	670
%	17.76	31.19	27.46	23.58	100

Question 24: I take part in societal actions such as protests, (online) petitions ... to put these global topics (e.g. racism, poverty, climate change, international conflicts, inequality between men and women, gender wage-gap ...) on the map.

These three questions refer to their degree of engagement with issues of social inequality. Thus, we compare, as can be seen in Fig. 11, whether they inform themselves, whether they feel responsible for doing something, and whether they finally take part in protest actions, petitions, etc.

When asked about whether they inform themselves about social issues, the majority say *yes*, with 52.99% stating *sometimes*, and 23.13% stating *frequently*. When asked about their feeling of responsibility for social issues such as racism, poverty, inequality, etc., we can see that 52.99% agree, i.e. they feel *quite responsible*, and 19.40% feel *strongly responsible*. In other words, the majority feel responsible for social issues.

In this item, they were asked whether they took part in protests, petitions, etc., to solve the social issues mentioned above. We thought it appropriate to show the results in comparison with those of the previous questions because, as we can see, although the majority felt quite responsible about these issues, the same is not true with regards to taking part in protests, petitions or other actions to eradicate social differences. We see that 39.70% have *never* taken part in such actions, and 31.04% have only *occasionally*.

The number and percentage of answers in this section is summarised in the following Table 4

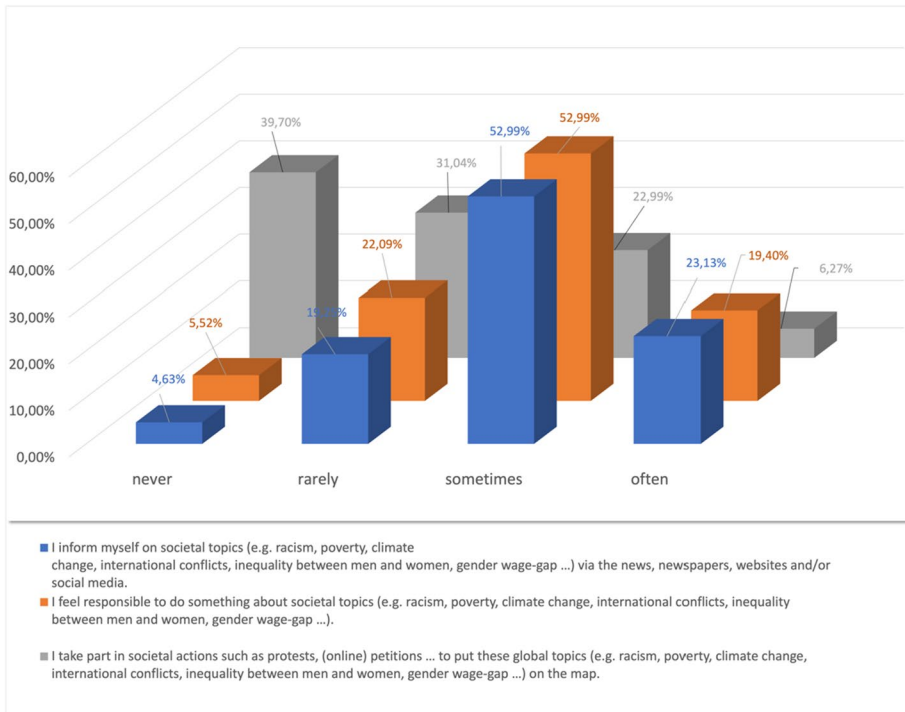


Fig. 11 Level of interest and responsibility on social topics

Table 4 Number and percentage of answers in section “Me and my place in the World”

Me and my place in the world	1	2	3	4	Total
<i>Q22</i>					
#Answers	31	129	355	155	670
%	4.63	19.25	52.99	23.13	100
<i>Q23</i>					
#Answers	37	148	355	130	670
%	5.52	22.09	52.99	19.40	100
<i>Q24</i>					
#Answers	266	208	154	42	670
%	39.70	31.04	22.99	6.27	100

7 Limitations and Future Research

The main limitation of the present study is that this project is not fully complete. Therefore, we cannot yet know the effects that the VR materials that are being developed to work on global citizenship, will have on the education of students involved in the project. For this reason, further research will consist of finding out what impact this type of technology has on the learning of competences as complex as global citizenship.

Educating for global citizenship is a complex objective that requires broad actions, and clearly the use of VR is not sufficient for the acquisition of the necessary competences, such as critical thinking and the formation of one's own thoughts. To this end, one solution would be to generate assessment indicators on the global citizenship competence which are not based solely on subjective and qualitative opinions of the students, but on concrete actions that show its acquisition and involvement of teacher training as agents involved in the learning process.

In this sense, VR technology can help to bridge the gap between countries without leaving the classroom. This is one major advantage, as students can experience places and learn about art, culture, history and different religions—essential aspects to generate free and critical thinking that contributes to the learning of global citizenship, thus reducing inequality gaps. However, for this to happen, it is necessary to generate methodological actions that go hand-in-hand with technology, such as developing critical thinking skills in students that generate interdisciplinarity, holistic vision and positive synergies (Mesa, 2021).

This study acknowledges the limitations with respect to VR technology itself. As it is a relatively new form of media, it is not yet widely available in educational centres. Moreover, as we have seen, there are certain difficulties when it comes to its use by teachers due to its novelty, so it would be important to generate training processes for teachers in the use of this technology.

Furthermore, as the study has previously stated, VR involves the creation of artificial environments that simulate the reality that a person can appreciate through their senses (Lowood, 2015). In this sense, the limitation is powerful because today the capacity of human senses to appreciate details exceeds the capacity of technology to reproduce them (Sánchez-Cabrero et al., 2019a, 2019b). It is also true that the development of this technology (in particular VR glasses) has in some cases caused users to experience vertigo. However, it is expected that this limitation will gradually be resolved, giving rise to increasingly realistic and comfortable scenarios for the human senses.

In addition, the current resolution of digital screens are a limitation for their continued use. Current VR equipment does not have the ideal resolution to display the visual details of environments, such as reading text in VR (Pei-Luen et al., 2018). Furthermore, according to Cabrero et al. (2019), continued exposure to blue light spectrum displays may be another undesirable effect of VR use. It is important to note that such limitations are common with new technologies, and they will gradually make way for new and better solutions that address these limitations, especially given the advantages they can bring to learning processes.

8 Discussion and Conclusion

With regards to the status of the concept of global citizenship amongst students, the results of the questionnaires indicate that students generally wish to resolve conflicts collectively and, in this respect, school has a fundamental role to play in teaching them how. This competence is essential in order to be able to understand others with whom one disagrees or does not share ideas, values or beliefs; an indispensable component of global citizenship. Most of the students surveyed say that they empathise with people they disagree with. However, the study found that many have difficulties in doing so, with a moderate percentage reporting that they only sometimes empathise with others of differing viewpoints;

another key component in the acquisition of global citizenship. In this sense, bearing in mind we live in an environment characterised by uncertainty, we must provide keys that improve our understanding of the reality we live in, so that we can exercise the active and committed citizenship we long for (Mesa, 2021). According to this author, it is essential to overcome individualism and place the interdependence we have as human beings at the centre.

According to this last concept, it is particularly striking the question of where students feel they belong, since, as the results show, many do not identify as European citizens. Spain and The Netherlands stand out in particular, as they are the two countries where students either do not feel European (Spanish) or only a very low percentage do so. This fact should make us reflect on the importance of being able to educate under the umbrella of European citizenship, and perhaps not so much under the prism of our individual countries. The study also found that many students identify as “Citizens of the World” as opposed to “Europeans”, a finding that should be explored further. This, we determine, could be an objective of the *ART* Project: to educate for global citizenship with a special focus on Europe.

On the other hand, it is also remarkable to see how many students are interested in learning about other religions and how others live in different countries, as well as their art and history. These results are undoubtedly positive for this project and for the achievement of the Sustainable Development Goal on global citizenship, as interest is the first step towards acquiring a tolerant vision.

Finally, the analysis of the pupil’s involvement in social issues is intriguing, as although many stated they are informed and feel responsible for doing something, when asked about concrete actions, the opposite was evident. In other words, pupils are interested and feel somewhat responsible, yet little action is taken. Perhaps one of the most important aspects of education for global citizenship, is to make them aware of their role in improving social problems, as these are situations that concern us all if we feel part of the same global citizenship.

In conclusion, answering the research question, we can see that although there is a high interest in learning about other cultures, art, religion, history and ways of life, students are not yet adequately educated towards global citizenship. It is therefore essential to deepen the capabilities needed for the acquisition of global citizenship, which is one of the objectives of the *ART* Project, focusing not only on the technology that allows easy access to other realities and cultures, but also on how it is used in the classroom. This, as a necessity, involves teacher training; training that must be both in digital competence and in methodological competence, in such a way that enables schools to deliver inclusive education (Ibáñez, 2021).

With regards to how VR can help to improve and enhance global citizenship education, from all the answers obtained both in the discussion and in the survey, it can be concluded that VR can be a very interesting element with great potential to be implemented in the educational field. This study finds that VR can provide great support to teachers, allowing students to enjoy different environments in the classroom, and to acquire knowledge in a more playful and interactive way. Moreover, as the *ART* Project aims to achieve the use of VR in the educational field, as it will be also useful to help students to develop their ability to think critically and to form their own opinions while dealing with topics related to art and citizenship.

However, as it has been mentioned, there are still some difficulties and obstacles that make the implementation of VR in the classroom complicated or unrealistic. For instance, it requires a specific professional development of the teachers involved, and the creation of

resources and materials can sometimes be tedious and time-consuming. Furthermore, the economic aspect should be considered, as the acquisition and maintenance of the necessary elements to carry out this type of learning can be costly, and some schools or educational institutions cannot afford to pay for them.

Needless to say, the situations we are currently facing, most notably as a consequence of the COVID-19 pandemic, and the resulting need for online education, has led to a change in the educational context and implementation of new educational techniques and elements. The innovative tool and the materials created during the lifetime of the *ART Project*, will help teachers and education experts to overcome these obstacles and provide its users with a series of elements and scenarios accessible from the classroom itself. All this will have a long lasting, positive impact. Not only on the students partaking in the project, but also on the world around them. The world we are all global citizens of, together.

Author Contributions All authors contributed to the study conception and design as they are participating in the ART project. Material preparation, data collection and analysis were performed by all of them cooperatively, as it was also done so the written and revision of the manuscript. All authors read and approved the final manuscript.

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Data availability The data was get with a questionnaires tool developed by the Czek partner and available in <https://inplace.cz/art/>. An excel with all the data downloaded from there and used in the article can be access in the link <http://tinyurl.com/DAS-ART-MarianoSanz> with all the questions in the second page.

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

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