

I01 – Needs Analysis and EPALE discussion

Report





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Introduction

Nowadays, the COVID-19 has made travelling more difficult, influencing the mobility of everyone, but also of learners and teachers. This situation has created the need to acquire new technical skills and to develop new educational plans which would allow learners to continue to enjoy different places without the need to travel.

One of these new educational actions has been the introduction of Virtual Reality (VR) technology into schools. Many schools had already started adopting VR before the pandemic, but many more schools started using VR once the pandemic highlighted the need to implement new ways of teaching.

Virtual Reality allows learners to experience a wide variety of destinations from across the world without ever having to leave the classroom. It can also be a way to better educate students in primary and secondary education about the changing world in which we live through an innovative and appealing way.

The ART project intends to connect Virtual Reality methodology to global citizenship and art education therefore making it possible to (online) teach global citizenship including art, culture and religion in an attractive and creative way (while reducing the CO2 emissions!).

The ART project aims at providing a special training model that can guarantee:

- The opportunity for **pupils** between the ages of 8 and 16 to receive innovative education on global citizenship (including art, culture, religion, etc.), with the aim of exploring and stimulating their interest in many areas
- The possibility for **teachers/educators** to contribute to the development of the teaching materials and the presentation of this material on the platform and via the app via the VR method to stimulate the inclusive nature of education and and to be trained to do so.

In order to design the different teaching materials that will be contained on the platform, a need analysis has been carried out in each of the countries participating in the project. This need analysis focuses on the needs of teachers and education experts in all partner countries, as well as the needs of pupils regarding global citizenship and art education. Moreover, the objective of this study is to assess the situation that can be found in each of the country's partners regarding Virtual Reality, what the relevant points are, the strengths and what will be the risk that we can face by developing this project.



Methodology

In order to develop a strong need analysis that would lay the foundations for the materials that will be developed during the project's lifetime, both a discussion on EPALE and a need analysis survey have been carried out.

The first one, the discussion on EPALE, involved from 2 to 5 experts in the field of education from each partner country. They were asked different questions related to Virtual Reality and the possibility to implement it in the educational field. The questions were the following:

- What is VR technology and how does it contribute to innovation in education? Define VR technology on an abstract level and distinguish the relevant challenges.
- How can students, teachers and other experts and the professional education field be involved in this?
- How can publicly accessible material for the VR application be developed that does not infringe copyrights? How can we deal with permission from museums? (Tip on this: Works older than 75 years are exempt from European copyright.)
- What can VR mean in a traditional learning context, for example in a blending learning and / or co-creation context or in distance learning?
- How does the educational material fit in a context with different types of students (levels) from different countries?
- What are the possible pitfalls and what solutions within the implementation in this project?

The second element of the study consists of a need analysis survey containing 25 questions about teachers' perception and knowledge of Virtual Reality. The survey was created using the SurveyMonkey tool and was translated into all partners' languages. It was completed by more than 20 teachers (primary and secondary education) in each partner country.

The survey consists of three different sections. The first section aims to obtain personal information from the teachers answering the questionnaire, including questions about their country of residence, gender, level they teach, years of experience and their experience with technology and virtual reality.

The second section focuses on obtaining detailed information about each teacher's school context, with questions about the use of VR in their schools, the correct equipment of VR resources and materials, teacher training, the feasibility of implementing VR, 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 places they would like to see created with VR. Finally, this last section also aims to find out whether these teachers would like to increase their knowledge of VR and whether they think they would implement this type of resource in their future lessons.



Results

The 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 virtual reality experts who participated in the EPALE discussion:

What is VR technology and how does it contribute to innovation in education?

Regarding this question, most of the experts interviewed shared the idea that VR can be a really useful tool both in the classroom and in e-learning contexts. According to Mariella Maiorano, a Primary School teacher 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”* also encouraging *“greater emotional involvement than traditional lessons”*.

This new way of experiencing the world will drastically change the current educational approach being learners able 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”* (Saturio Rodríguez, Spain).

Virtual Reality will place education outside the walls of the school, making it possible to access to every imaginable topic or element and *“to enable students to experience practical situations in a safe and accessible way”* (JaapJan Vroom, The Netherlands). As it is stated by Anne van Hekke (The Netherlands), thanks to this Virtual Reality children can experience places or objects that they might never see otherwise. Virtual Reality 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...”* (Jan De Lange, Belgium) or to explore a wide range of scenarios, especially the ones related to art. 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”*. (Rocío Larena, 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”* (Angela Candela, Italy). Thanks to VR, students could also experience past times and learn different past time events in a more dynamic and attractive way.

Apart from that, Virtual Reality could also help learners in many other fields, as it could be *“definitely good as an aid to geography, history, science or language teaching”* (Lenka Horáková, Czech Republic). Virtual Reality could be also a good aid in Mathematics lessons, since, for example, as it is stated by Libor Olbrich (Czech Republic) *“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 several experts, could be very useful in situations similar to what happened during the Covid 19 confinement, allowing students to continue learning outside school and enjoying the previously mentioned environments.

Another interesting aspect mentioned by Libor Olbrich (Czech Republic) 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"*.

How can students, teachers and other experts and the professional education field be involved in this?

Most of the experts agreed that teachers and students should play a main role when implementing Virtual Reality into the educational field.

In the case of teachers, most of the experts claimed that they should be a fundamental part and help when creating VR contents. For instance, they *"can map out where, when and how VR can offer added value and which learning goals can be achieved (more) efficiently"* (Jan Van Schaftingen, Belgium). Moreover, as it was also stated by some of the experts, teachers will also have to get used to working and using VR in the classroom to enjoy all its benefits and to implement it correctly, since they will be the guides and 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"* (Angela Candela, Italy)

On the other hand, students *"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"* (Jan Van Schaftingen, 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"* (Angela Candela, Italy). All these VR experiences will drastically change the traditional perception of education, making students the main protagonists of the educational process since they could *"(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"* (Jan Van Schaftingen, Belgium)

How can publicly accessible material for the VR application be developed that does not infringe copyrights? How can we deal with permission from museums?

This question was hardly answered by any of the experts 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 for the use of specific resources and materials, Jan Templin (Germany) stated that *"politics need to step in to solve these copyright issues and help push education forward"*. Moreover, 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”.

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

Most of the experts agreed that Virtual Reality can be a useful resource in every single context, just paying attention to the different learning levels or groups where we would like to implement it.

As it has been mentioned before, VR could be a great resource that would definitely enrich the learning process. For example, Jan Templin (Germany) states 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”* (Grazia Abbascià, Italy).

Moreover, as it has been also mentioned before, the use of VR in distant learning can be a good resource to explore the world from our own houses since *“places or objects are now accessible that might otherwise never be seen by children”* (Anne van Hekke, The Netherlands).

How does the educational material fit in a context with different types of students (levels) from different countries?

As some of the experts explained, nowadays’ students are familiar with the use of different educational technologies, so the implementation of Virtual Reality within the educational context should not be a problem for them.

The material created, as most of the experts suggested, should be developed paying attention to the different learners skills and competences. In order to do that in a proper way, teachers will play a really important 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”* (Rocío Larena, Spain). Moreover, some other experts also state that these VR resources could be used in every single country since *“there are contents and disciplinary knowledge that are universal and compulsory in all school curricula”* being it only necessary to *“adapt each material to the different languages and then a socio-cultural adaptation in those that are required”* (Nancy Karen Ramírez, Mexico).

What are the possible pitfalls and what solutions within the implementation in this project?

As it has been stated before, most of the experts agreed that the main benefits of virtual reality have to do with the broad range of contents and topics that it can cover and with the improvement of learners' motivation and engagement due to its more practical features.

Regarding disadvantages that could be experienced when implementing VR in the educational context, the financial issue was the most recurrent problem that experts mentioned since the

different materials and resources that need to be produced and the necessary equipment that should be acquired can be expensive and sometimes unaffordable by some schools or educational institutions.

Another problem addressed was the fact that these resources promote a very individual learning context, being “*difficult to get an entire group into the same learning context*” (Tom Demuyck, Belgium).

Teachers’ training is an aspect that should be necessarily taken into account since they play a vital role in the implementation of this kind of resources within the classroom. However, as mentioned by Prof. Alberto Fornasari (Italy), there is sometimes “*certain resistance to innovative teaching by a large part of the school teaching staff*”.

The survey was answered by more than 100 **teachers** from Primary and Secondary Education.

Q1 Country

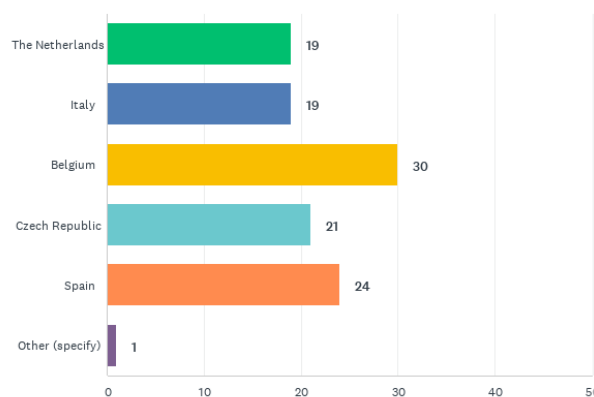


Table 1: Country

More precisely, 40,52% of the teachers completing the survey were Primary Education teachers and 41.38% of them were Secondary Education teachers. The 18.1% of these teachers indicated that they belonged to a different educational level, such as Higher Education or VET.

Regarding these teachers’ gender, 30.17% of them were male and 68.83% were women.

Theses **teachers’ experience** in the field of education is seemed to be quite heterogeneous, since as it can be seen in the graphic below, a 31.9% of them have no more than 5 years of experience, 19.83% have from 5 to 10 years of experience, 16.38% have from 10 to 15 years of experience, 12.07% have from 15 to 20 years of experience and 19.83% have more than 20 years of experience.

Regarding the level of use of technology in education, it could be said that most of the teachers answering the survey felt familiar and comfortable with its use. On a scale from 1 to 6 (1 meaning a very basic knowledge and 6 a high knowledge), the average of the answers obtained was 4.

Q4 Years of experience

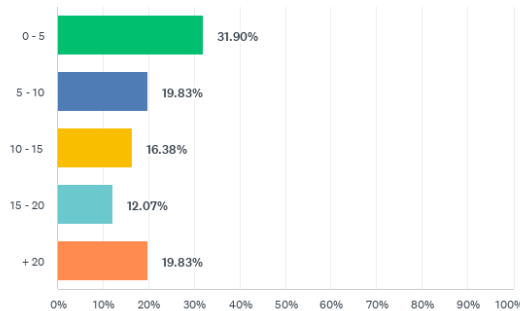


Table 2: Years of experience

However, when it came to their experience **using Virtual Reality** the answers obtained were not as satisfactory.

Q6 Have you ever tried Virtual Reality?

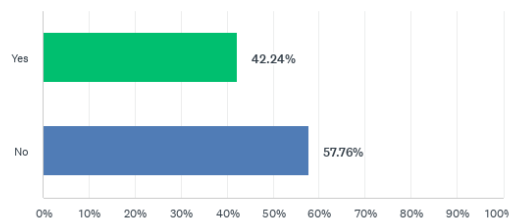


Table 3: Have you ever tried Virtual Reality?

More precisely, 42.24% of these teachers stated that they had used Virtual Reality, while 57.76% of them indicated that they had never used Virtual Reality before. The results obtained from the Belgian, Dutch and Spanish teacher's replies were highly significant since only 16.67% of Belgian teachers, 31.58% of Dutch teachers and 29.17% of Spanish teachers affirmed having used Virtual Reality before. On the contrary, this percentage was higher in Czech Republic and Italy where 61.9% of Czech teachers and 52.63% of Italian teachers affirmed having used Virtual Reality before.

Moreover, the results showed that most of these teachers did not find using Virtual Reality **easy**.

Q7 How easy is Virtual Reality to use?

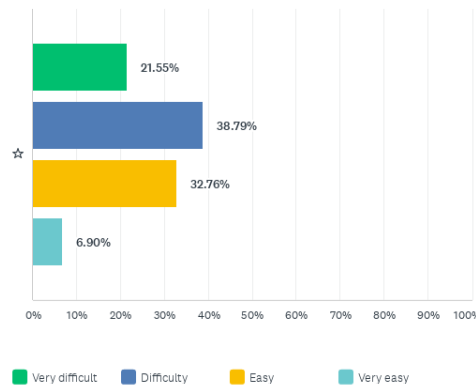


Table 4: How easy is Virtual Reality to use?

21.55% of them claimed that they found Virtual Reality very difficult and 38.79% of them indicated that they found it difficult to use, making a total of more than 60% of teachers having difficulties when using it.

Results are even less promising when being asked whether their **schools** use VR frequently.

Q8 Does your school use VR frequently?

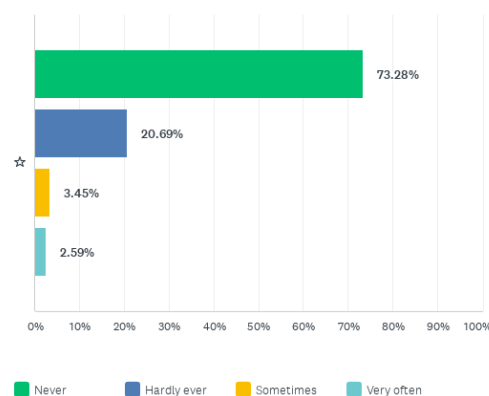


Table 5: Does your school use VR frequently?

73.28% of these teachers (86.67% in Belgium, 76.19% in Czech Republic, 79.17% in Spain, 68.42% in The Netherlands and 47.37% in Italy) indicated that they their school never used Virtual Reality and 20.69% of them claimed that their school hardly ever used it. Only 3.45% of these teachers' schools used Virtual Reality sometimes and 2.59% of them used it very often.

Moreover, the results when they were asked whether their schools were well equipped were not very good either. 62.93% of teachers indicated that their schools were not equipped at all with Virtual Reality materials and 23.28% of these schools were poorly equipped. These results

coincide with the responses obtained in the EPALE discussion, in which experts stated that this problem could be related to financial issues, since this material can be expensive and sometimes unaffordable by some schools or educational institutions.

These teachers also indicated that school staff is not well trained to use Virtual Reality. 72.41% of them indicated that this staff is not trained at all (96.67% in Belgium and 80.95% in Czech Republic) and 22.41% of them indicated that the staff was poorly trained. These two percentages make a total of nearly 95% of answers indicating that the staff was not very well trained in the field of Virtual Reality.

Moreover, when talking about their personal skills, even though the results were not good either, they seemed a little bit more confident with their training on Virtual Reality. 47.41% of these teachers felt they were not trained at all to use VR and 29.31% felt they very little knowledge related to Virtual reality.

However, these teachers' perception of the possibility to **implement** Virtual Reality activities in the classroom seems to be more promising.

Q11 How feasible would it be to implement Virtual Reality activities in the classroom?

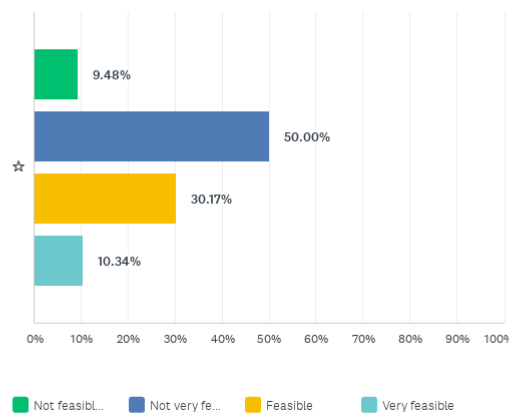


Table 6: How feasible would it be to implement Virtual Reality activities in the classroom?

Nearly 10% of the teachers indicated that it would not be feasible at all to implement Virtual Reality in the classroom and 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.

Contrary to negative results obtained in the previous questions, when asked how useful they think Virtual Reality is, 42.24% of these teachers indicated that VR is useful and 41.38% of them indicated that it is very useful.

In the next question, teachers were asked about the **benefits** that Virtual Reality can have in the classroom. In the image below, the most selected options are shown:

ANSWER CHOICES		RESPONSES
▼ It helps to fix concepts through playful dynamics, generating more lasting knowledge.	→	73.28% 85
▼ It focuses students' attention, generating greater cooperation.	→	51.72% 60
▼ It favours the inclusion of students with difficulties.		47.41% 55
▼ It accelerates learning.		36.21% 42
▼ It improves comprehension.	→	57.76% 67
▼ It favours the personalisation of teaching.		26.72% 31
▼ Other (specify)	Responses	9.48% 11
Total Respondents: 116		

Table 7: Benefits of Virtual Reality

Apart from the given options some teachers indicated other benefits such as its modern and attractive approach that could make lessons more interesting and that would allow students to experience environments and elements that they could not see otherwise.

Teachers were also asked whether they agreed or disagreed with specific statements related to precise benefits of the use of Virtual Reality.

The first of these statements aims to verify if Virtual Reality can increase learners' 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% of them strongly agreed with the statement.

The second statement aims to check teachers' perception of whether Virtual Reality 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. On the contrary, 33.62% of these teachers agreed and 58.62 strongly agreed with the statement.

Finally, the third of these statements, aims to verify if VR can give students 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% of them strongly agreed with it.

These positive results obtained from the previous three statements definitely show us that teachers are aware of the benefits that Virtual Reality offers.

Teachers were also asked about possible **disadvantages** that the use of VR could have. In the image below, the most selected options are shown:

ANSWER CHOICES	RESPONSES
▼ The hardware needed is still very expensive.	68.97% 80
▼ This technology requires very specific training.	60.34% 70
▼ It can be a distraction.	29.31% 34
▼ It can lead to sensory disorientation.	17.24% 20
▼ It can be used to escape from reality.	25.00% 29
▼ Other (specify)	7.76% 9
Total Respondents: 116	

Table 8: Disadvantages of Virtual Reality

On the other hand, some teachers also added different disadvantages such as the fact that this technology could be labor and maintenance intensive and that it could become rapidly obsolete. Moreover, some others pointed out that there could be some teachers who might not be open to learning new methodologies.

Teachers were also asked about which **areas or subjects** they think would benefit most from implementing VR activities.

Q19 In your opinion, which areas or subjects would benefit most from implementing VR activities?

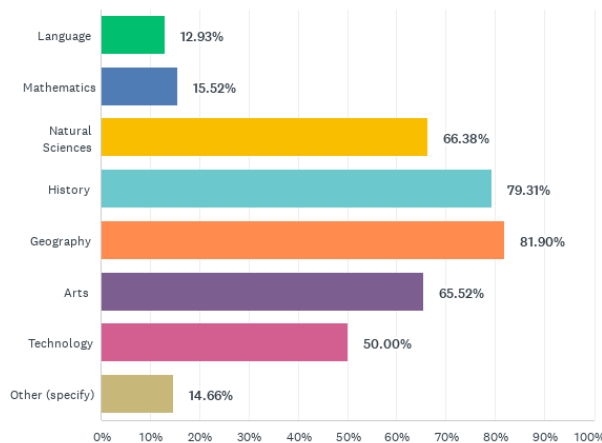


Table 9: In your opinion, which areas or subjects would benefit most from implementing VR activities?

As it can be seen in the previous picture, the most selected areas or subjects were Arts (65.52%), Natural Sciences (66.38%), History (79.31%) and Geography (81.9%). Some other teachers also mentioned the possibility that Virtual Reality could be used in Musical Education, Social Science, Physics and Second Language lessons.

As it has been said before, experts participating in the EPALE discussion and teachers completing the survey, affirmed that Virtual Reality offers several benefits. Moreover, some of these benefits could be related to the development of a wide variety of educational needs. Teachers

were also asked about which of the given **educational needs** they thought Virtual Reality could help to develop.

From the results obtained it can be seen that problem-solving skills was 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 world experience.

Q20 What educational needs would you like to see met through the implementation of VR activities?

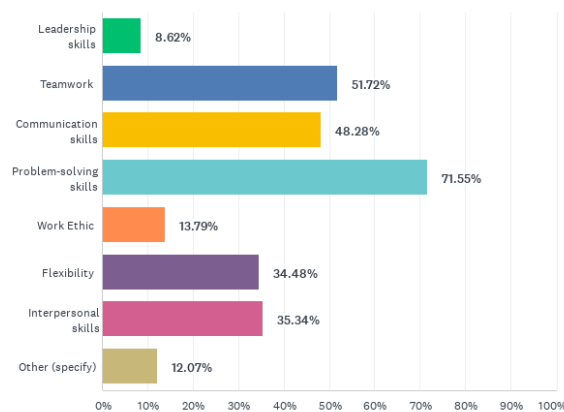


Table 10: What educational needs would you like to see met through the implementation of VR activities?

The next question of the survey focuses on the elements or topics that these teachers would like to be 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, computers or machines components, mechanics, volcanic eruptions, simulation of meteorological phenomena, formation of landscapes, ecosystems or landscapes such as the underwater world, natural parks or the polar regions, origin of the universe, internal geology of the planet, plant photosynthesis, spatial models of atoms, the Solar System, driving directions, representation of children’s books and current problems such as xenophobia, discrimination, dissent, gender issues etc.

In the next question, teachers were asked to select which of the given **places** they would like to see implemented using Virtual Reality.

Q22 In which places of cultural interest would you like to see virtual reality implemented?

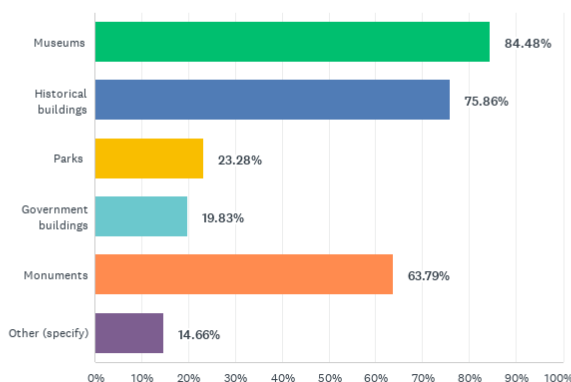


Table 11: In which places of cultural interest would you like to see virtual reality implemented?

Most of them indicated that museums (84.48%), historical buildings (75.86%) and monuments (63.79%) would be the most suitable elements to be implemented using virtual reality.

When they were 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 (The Netherlands), Wereldmuseum (The Netherlands), the Louvre (France), the Prado Museum (Spain), Thyssen Museum (Spain), the National Museum of Agriculture (Czech Republic), Plantin-Moretus Museum (Belgium) or the Open-air museum in Rožnov pod Radhoštěm (Czech Republic); **historical events** such as the Battle of Hastings; some **historical buildings** or **fortifications** such as the Prague Castle (Czech Republic), the Karlštejn Castle (Czech Republic), Kroměříž Castle (Czech Republic), the Swabian Castle, (Italy) Castel del Monte (Italy), the Colosseum (Italy), the Gravensteen (Belgium), the Royal Alcázars of Seville (Spain), or Santa Bárbara Castle (Spain); **religious buildings** such as the Sistine Chapel (Vatican City), the Mosque-Cathedral of Córdoba (Spain) or Sedlec Ossuary (Czech Republic); **political buildings** such as the Port Authority Building (Belgium), parliaments or congress's buildings; some **parks** or **gardens** such as Villa Borghese (Italy), Park Güell (Spain), the Retiro Park (Spain), Real Jardín Botánico de Madrid (Spain), or Průhonický park (Czech Republic); or **town squares** such as the Plaza de España in Sevilla (Spain)

Teachers were also asked whether they would like to acquire a better **knowledge** of Virtual reality.

Q24 Would you like to acquire a better knowledge of VR?

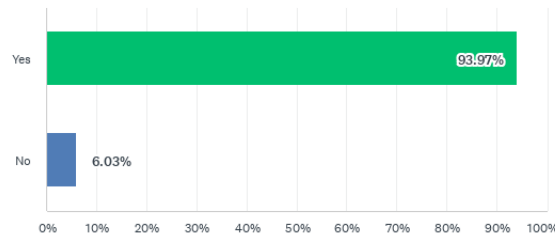


Table 12: Would you like to acquire a better knowledge of VR?

Almost all of these teachers (93.97%) gave an affirmative answer.

Finally, teachers were asked how likely it would be that they used Virtual Reality in their **lessons**. In this case, fewer affirmative answers were obtained than in the previous question (68.97%).

Q25 Are you likely to use VR in your lessons?

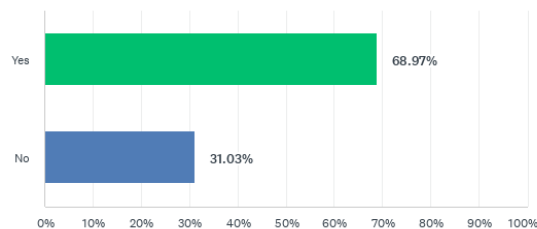


Table 13: Are you likely to use VR in your lessons?

This positive percentage would be slightly smaller in the case of Spain (62,5%), Belgium (63,33%) and Czech Republic (66,67%) and more or less the same in the case of Italy (68,42%). On the other hand, the slightly higher percentage than 30% of these teachers who are still reluctant to implement VR in their classrooms could be explained by the high cost of the necessary materials and resources, which some schools cannot afford, or by the necessary training that this type of resource requires. Contrary to these percentages, a significantly higher percentage was obtained in the case of The Netherlands, where 89,47% of teachers indicated that they would use VR in their lessons.



Conclusion

Needless to say, the situation we are currently facing, most notably the COVID-19 pandemic and the consequent need for online education, have led to a change in the educational context and the implementation of new educational techniques and elements, being Virtual Reality one of them.

From all the answers obtained both in the discussion and in the survey, it can be concluded that Virtual Reality can be a very interesting element with a great potential to be implemented in the educational field. This Virtual Reality 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 this Virtual Reality in the educational field will be also useful to help students to develop their ability to think critically and to form their own opinion while dealing with topics related to art and citizenship.

However, as it has been mentioned, there are still some difficulties or obstacles that make the implementation of Virtual Reality in the classroom still complicated or unrealistic. For instance, the use of VR requires a specific professional development of the teachers involved and the creation of resources and materials can be sometimes tedious and time-consuming. Moreover, the economic aspect is also an aspect that should be taken into account, 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 could not afford to pay for them.

These different obstacles vary depending on the country as it can be seen in the different answers obtained in the questionnaire, since, for example the percentage of schools never using VR (86.67% in Belgium, 76.19% in Czech Republic, 79.17% in Spain, 68.42% in The Netherlands and 47.37% in Italy) and the percentage of teachers having previous experience with VR (16.67% of Belgian teachers, 29.17% of Spanish teachers, 31.58% of Dutch teachers, 52.63% of Italian teachers and 61,9% of Czech teachers) is different in each of the countries participating in the project. These differences may be related to differences in the purchasing power of schools and teachers' technological training in the European Union.

The innovative tool and the materials created during the lifetime of the ART project, will help teachers and education experts overcome these obstacles and provide its users with a series of elements and scenarios accessible from the classroom itself, having a positive impact not only on students but on the world around them.

