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# Using geobrowsers and VR platforms to empower students' awareness of sustainability issues

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## Abstract

This paper explores the ways in which new information technologies, such as geobrowsers and VR platforms, can improve students' awareness of sustainability issues. These means make realistic experiences and opportunities for interaction in Geography classes much easier than in the past and can be used to enable students to travel across time and space to better understand the complexity of the World. Starting from an overview of some current education issues regarding Geography, it goes on to examine how new technologies and immersive tools may be used to help students practice geographical skills, especially those involved in observation activity. The last part of the paper also focuses on what the advantages and disadvantages can be when these technologies are brought into classes. Although it has been widely examined how digital maps and virtual trips can improve the sense of spatial concept in geography and how realistically these can simulate a field trip experience, the present work aims to uncover the potentiality of these tools by describing an actual experience carried out in a secondary school in 2020. It will be shown how a simulated three-dimensional environment and a virtual tour could enable students to get a different perspective in learning about environmental issues and to explore and get data to build their own knowledge.

**Keywords**: Geobrowser, Geography Education, Sustainability, Virtual Reality

## 1. Introduction

This work explores how low immersive rate technologies can help teach Geography with engaging and significant learning strategies. It shows a class experience designed to foster secondary school students' awareness of environmental issues while providing a wider insight into teaching methodologies and engagement issues.

It moves from the professional experience of the author, who has been teaching Geography for nearly twenty years, observing a growing loss of geographical literacy among young generations. The same concern has been expressed by many authors and the International Geographic Union (IGU) in its latest statements.

If the reason for this condition must be addressed both to a misconception of the role of

 

the discipline in the education system and to the growing complexity of the global connections that Geography must explain, an in-depth debate on the very teaching of Geography is needed.

At the same time, Sustainability Education has become an urgent topic within the 2030 AGENDA and Geography is the discipline that can lead young students in working on the 17 UN Goals.

Taking this into account, this paper sets out to investigate at least some of the many factors that can be involved in that debate: motivation to learn with digital tools and active learning strategies.

## 2. New challenges for Geography teaching

Given the IGU definition of Geography as "*the study of Earth and its natural and human environments. Geography enables the study of human activities and their interrelationships and interactions with environments from local to global scales*" (International Geographical Union, 2016, pp. 4-7) and the same organisation's concern with the spread of geographical illiteracy around the world, it is necessary to think about geography education as an issue. As something strictly related to the understanding of how young people learn and how the teacher can support their learning, given that sadly, many teachers have little explicit knowledge about learning strategies (Ferretti, 2014, p. 105), which are often not even tackled during their training. However, students' poor geographic education is not only a matter of method.

In Italian schools the nearly complete absence of geography as a subject in the senior high school deprives students of indispensable areas of knowledge (De Vecchis et al., 2011). For students aged above 14, the discipline is properly taught only in economy-oriented technical schools, while students attending grammar schools - the most widespread choice - are supposed to study it together with history for only a few hours during the first two years. Lastly, even the latest educational reforms in vocational training (2017) have not positively changed the absence of geography education even in this kind of school, as it is planned to give only one or two hours per week to the subject in just one year.

A similar condition is common in different European countries where geography as a discipline is challenged by several threats, from the tightening of budgets for teaching and research at all levels to the lack of public recognition and legitimation of the value of geographical thinking and competencies (Droogleever Fortuijn et al., 2020). Consequently, just as for the Italian schools also in other countries the number of geography hours in schools is less than it used to be (van der Schee, 2012) and the consequence is that students hardly achieve a confident level of competences to understand the world around them.

Therefore, if the amount of time for teaching Geography is limited, it is even more urgent to focus on the learning process of the discipline and it would be advisable to make good strategies explicit in order to improve the teachers' role in their pupils' education. Following a cognitive approach, the main issue would be to keep students actively involved in their own learning while teachers could act as facilitators of the process. At this level, fostering motivation, defined as the complex varying made up of active ruling, self-efficacy, and self-regulation (Mason, 2021, pp. 104-105), is something teachers must deal with.

When planning an activity aimed to study geographical phenomena, the starting point should be observation; in fact, observing the world is the main key in the geographic method. In fact, observing is something very different from watching and students need to get involved in that process with emotional and personal references to make that activity didactically significant (see also Giorda, 2014).

Many tools are available to help this activity, starting from field trips and going on with books, images, maps, videos and GIS. Considering the latter, these tools are considered particularly useful to analyse and solve geospatial problems by applying spatial analysis to understand complex situations including geographical, social, economic, and cultural phenomena (Azzari et al., 2013).

That is why in the following paragraphs a focus on such kinds of tools, with a class activity example, will show the potentially good practice to foster environmental awareness together with other geographical skills.

 

## 3. Geobrowsers and low immersive apps as an achievable learning environment

The integration of GIS into educational aims and learning approaches can promote and conduct stimulating and fulfilling experiences that show the power of geography's spatial and temporal perspectives (Dangermond and Pesaresi, 2018) and there are many examples of class experiences that successfully managed these activities. At the same time, working with GIS at school is anything but an easy thing to do. The first limitation lies in the availability of usable devices, together with the need for technical support when the software installation is necessary and a likely license managing issue.

Furthermore, some of these platforms are quite complex and require considerable training time to be confidently used, first of all by teachers and then by students. Considering the few weekly hours given to the discipline at secondary school, that means that GIS is often used only in specific and limited projects and not in the ordinary teaching practice of Geography.

That is why lighter GIS, such as geobrowsers, can be considered a good compromise to plan stimulating and meaningful activities regarding spatial analysis.

A similar consideration can be phased by talking about high immersive rate VR tools. Spread among the gaming and entertainment world, these are not much used in education due to high costs, age usage limitations, and training-related difficulties. Bearing this in mind, even for these technologies a lighter and cheaper kind should be chosen to make the school experience concretely achievable.

Geobrowsers and low immersive apps are therefore suitable teaching tools because they are accessible, free, and customisable and need no specific programming abilities or high digital competencies for the users. At the same time, they can simulate field trips and direct observation effectively, even without the "Wow effect" of more realistic gaming and professional products, which can be very appealing but not necessarily suitable for education.

Ultimately, if engagement and effectiveness are the most urgent needs in geography classes, providing realistic experiences and opportunities for interaction is now much easier than in the past. Geobrowsers and low immersive VR apps can be used to enable students to travel across time and space to better understand the complexity of the World. A short description of a virtual tour made up of Google Earth Web and ThingLink platforms follows to demonstrate a good practice example.

## 4. Working on geography skills and sustainability issues

What does sustainability mean? The term has increasingly been used during the last five decades, starting from the United Nations' work on development and future generations. Along with the growth of that idea in society, a concern about the way in which education might deal with it has been raised in the school community. In order to address these concerns, geography has been given the responsibility to tackle education on sustainable development in the school curriculum (Smith, 2014).

In Italian schools sustainability has become a common topic for different subjects due to the Educational Ministry statement, "that schools are the institution that, before any other, can support the work of young people towards the 17 Sustainable Development Goals of the 2030 Agenda" (L. 92 del 2019), and the subsequent reorganisations of the curricula. Because this concept can be defined as a way of looking at the world, with a focus on the interactions between economic, social, and environmental changes (Sachs, 2015), a holistic perspective is needed.

Therefore, Sustainability Education requires an interdisciplinary approach (Anselmi, 2018), and geography, more than many other disciplines, is the one that can work on integrating different branches of knowledge. That is why it expresses all its educational potential on topics of sustainable development and environmental protection (Pasquinelli d'Allegra, 2017). Therefore, working on strengthening geographical skills means also fostering a wider competence: sustainability awareness.

 

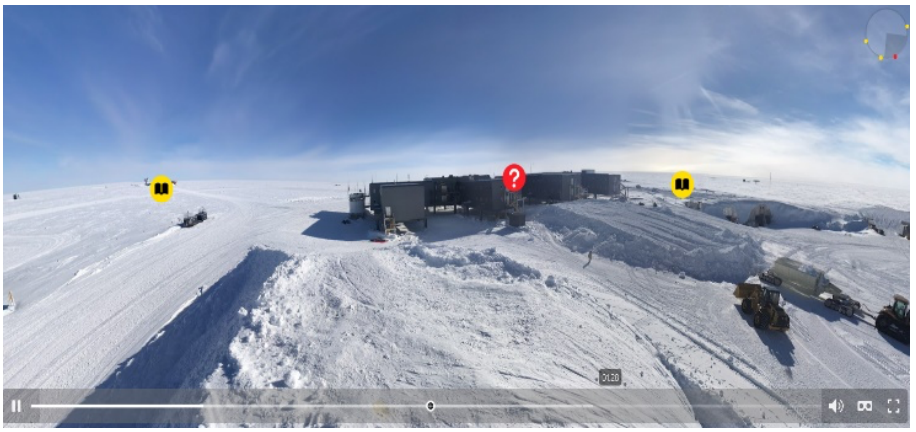

Figure 1. A 360° interactive image of the South Pole from the Virtual Tour.


Figure 2. An interactive image of Thailand from the Virtual Tour.

Starting from the following geography skills:

- asking geographic questions,
- acquiring geographic information,
- organising geographic information,
- analysing geographic information,
- answering geographic questions,

and by merging them with transversal skills also belonging to other disciplines such as science and digital data analysis, it is possible to build significant learner-centred activities that can help develop skills of inquiry and critical thinking. Such transversal skills are essential to help students explore the underlying political, social, and economic causes affecting the environment.

Designing the lesson plan and using this crossing operation on competencies, teachers can assess their pupils with original learning activities like the one examined in this paper. Using a customised set of immersive digital tools during a class activity, specific tasks can be assigned to students while they are traveling virtually. In this way, they can keep their focus on the topic avoiding distractibility, without losing the possibility to manage their path autonomously.

It is possible to ask students to locate and measure places (in terms of area and distance from other sites) or phenomena visible on the digital globe. It is possible to ask them to search for more information about objects added in the 3D or 360° images. In addition, students can move beyond the sets selected by the teacher and enlarge their views on a particular phenomenon. Furthermore, students can organise the

 

geographic information and analyse similarities and differences between the elements they come across.

Geobrowsers and low immersive apps are ideal to help grasp the different aspects of sustainability, making it possible to access natural, social and economic data during the laboratory activity in an easy and familiar way.

Eventually, students can formulate hypotheses and interpretations that they can share and discuss in class.

## 5. A classroom learning experience

This paragraph describes how an actual activity with VR and a geobrowser was designed for and provided to approximately 150 students from the IIS Capellini-Sauro in La Spezia, Italy, during spring 2020.

The students, aged 14 and 15, used laptops and Chromebooks to experience a virtual tour built with Google Earth Web and Google Poly. The contents were specifically chosen in relation to issues concerning Climate Change and its impact on pristine environments such as in Antarctica. During the activity students were guided by a list of tasks given by the teacher to help them go on the virtual tour. They practically worked by themselves and occasionally needed some support to get to the end.


Figure 3. The three spheres of sustainability. Source: https://www.un.org/sustainabledevelopment/.

This simulated three-dimensional environment allowed students to get a different perspective in learning about the consequences of human actions on natural ecosystems, as they were able to explore and get data to build their own knowledge during the activity.

The activity itself was devised to be as inclusive as possible to get all the students involved, even those with learning or linguistic disadvantages. Thanks to the flexibility of time usage and a reading-friendly tool[1], all the students were able to adapt the activity to their specific learning needs.

Made with the tools from Google Earth Web, the tour made eight stops in different sites around the World with peculiar environmental issues somehow connected to Climate Change. At each stop, some additional information, images and links were added to help get a global perception of the problem chosen. In a selection of sites, links to interactive 360° images were added to empower the realism of the virtual experience. Thanks to the Google Poly platform[2], These interactive scenes could be used in the VR mode with a personal device adding the possibility to hear sounds and move autonomously around the selected area.

The students were able to visit different anthropic and natural environments regarding all the issues related to sustainability, thus emphasising the critical aspects of the conservation of natural habitats, and the protection of the social and economic assets of the realities examined. To give some examples of the places visited by the students in relation to environmental issues, we can mention the London stage on which the students were able to visit the large Heathrow airport, among other phenomena highlighted, and verify the environmental implications of a hub like the one examined in the context of world transport and the CO2 contribution that this industry creates in the atmosphere.

[1] https://www.microsoft.com/en-us/education/products/learning-tools.

[2] Google Poly closed on June 30, 2021. Its platform, as a 3D creation and viewer tool, has been used by many students and educators around the world to easily create low-poly objects with in-VR tools and share them with others.

 

On the Thai stage, students instead had an in-depth look at the cultural implications of mass tourism in a country struggling with the difficulty of preserving its cultural identity, as a result of the rapid increase in tourist flows taking place in recent decades. By means of immersive images, students visited some districts of Bangkok related to historical and artistic tourism and to the more difficult theme of sex tourism. Still remaining in Thailand and visiting some coastal sites, students saw how the issue of marine plastic pollution is becoming a growing problem in countries with rapid economic growth such as those in the south of Asia. Finally, by virtually visiting the Antarctic Peninsula, they were able to learn how this environment is endangered by rapid climate change and by the growing pressure of cruise tourism that endangers the fragile and unique coastal ecosystem of this continent.

All these characteristics were helpful in building environmental awareness and strengthening the knowledge of Climate Change related issues among the learners that were lastly asked to refer about their experience through a brief digital survey.

Figure 4. Students working at the virtual tour in a classroom. IIS Capellini-Sauro, La Spezia, 2020.

This survey collected students' feelings and opinions about the virtual journey. It was made up of twelve questions, some about their general considerations about the activity, some about their sense of immersion, and some about their learning process in relation to environmental issues.

When asked if they believed that geobrowsers and VR apps could help them learn geographically related topics, most of them (78%) answered affirmatively.

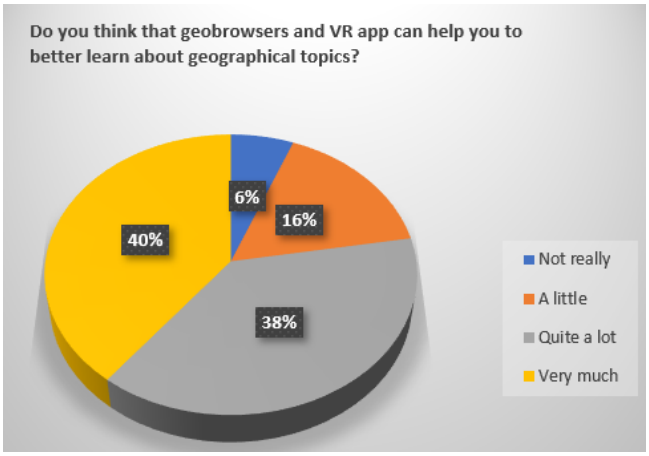


Figure 5. Evidence from the survey about the learning experience with geobrowsers and VR apps. Source: Author's elaboration.

When asked if they felt as if they were travelling while moving into the 360° scenes and listening to environmental sounds, 66% of them replied positively.

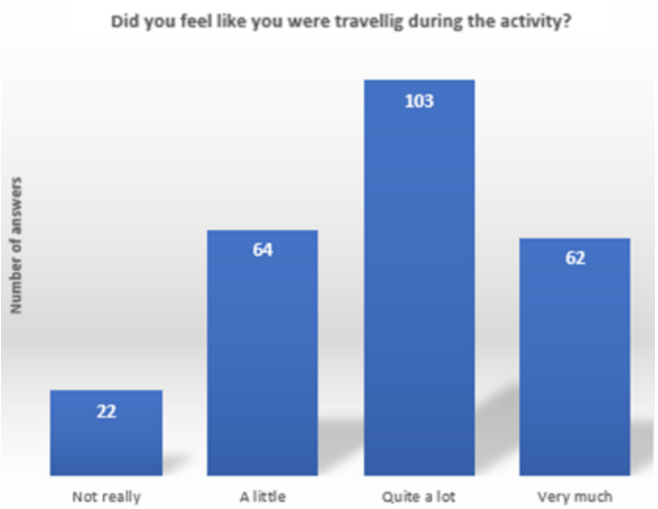


Figure 6. Evidence from the survey about the perception of immersion with geobrowsers and VR apps. Source: Author's elaboration.

 

When asked if they enjoyed and found it interesting to use such kinds of tools at school, the attitude expressed was almost the same as for the wish for the possibility of repeating the experience in the near future.

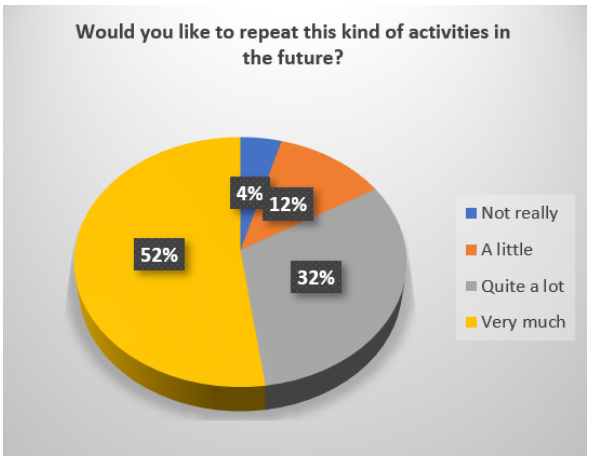


Figure 7. Evidence from the survey on the enjoyment of the activity with geobrowsers and VR apps. Source: Author's elaboration.

Finally, strictly in relation to sustainable and environmental awareness, the students were asked to freely express their attitudes about the virtual tour:

- *"It has been like looking down to Earth from the ISS: you can see how beautiful but and the same time limited is our planet;*
- *"What impressed me most has been seeing that there are no boundaries…unless we don't want them to be shown…isn't the World just one then?".*

In conclusion, they really had the feeling of going somewhere else during class time, but without getting lost.

## 6. Lesson leading issues

Leading a digital workshop activity at school is not an easy job. Despite the many advantages that can derive from using a student-centred methodology, rigorous planning is needed to avoid those students getting lost in the huge amount of data and tools they have been given to use.

Some concerns could arise from technical problems in relation to the device used for the activity as well as from a weak internet connection. At the same time, bad scheduling and class setting could be a problem, adding distractibility and chaos to the learning process.

Switching to the advantages of an activity like the one described in these pages, it is clear that engagement was the leading element that made that learning situation effective and lasting.

The student-focused approach made it possible to personalise the time and mode of the experience, involving everyone's participation. This self-leading learning modality was the right choice, not only to ensure inclusiveness but also the correct rate of freedom to search for the geographical information that students were most interested in.

## 7. Conclusions

Despite it being clear that geography makes it possible to analyse and understand the world critically and consciously, nevertheless these skills have become increasingly weak in the younger generations, so that new teaching methodologies and tools are needed to respond to the current educational demands.

On the one hand, geography teaching can benefit from using new digital tools to reinforce students' geographic skills, and geobrowsers and immersive tools, even if still undervalued in their didactic potential, can work efficiently on that. Accordingly, those means should be brought into ordinary teaching practice because if used properly they can even help the learning process about environmental education, active citizenship and complex global challenges (Pesaresi, 2020).

On the other hand, sustainability issues turn out to be a central matter in education. Teachers need to give good information on sustainable development, including environmental, social, and economic problems, along with providing students with the skills to think about possible solutions and negative effect mitigation in their everyday life.

In this direction, when designed with an interdisciplinary and interactive approach and combined with new technologies, geography

 

activities can help students understand the world critically and consciously. Consequently, even awareness to and engagement in sustainability issues can be carried out through student-focused teaching, since personal experience is the key to learning more about the environment and the human impact on it.

To magnify this experience, immersive tools can help build a link with the real world, creating new knowledge and learning with an enthusiastic attitude. Teaching the students how to think geographically can improve their education on sustainability and drive them to be an active part of the interpretative and decision-making process even in the long-life term.

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## References

1. Anselmi S.M., "Didattica per la sostenibilità Geography", 2018, http://www.ledonline.it/Geography-Notebooks/.
2. Azzari M., Zamperlin P. and Landi F., "GIS in Geography Teaching", *J-READING (Journal of Research and Didactics in Geography)*, 2, 2, 2013, pp. 27-42.
3. Dangermond J. and Pesaresi C., "The power of GIS language", *J-READING (Journal of Research and Didactics in Geography)*, 2, 7, 2018, pp. 7-12.
4. Delgado Pena J.J., "Using the Iberpix Geobrowser for teaching Geography: perspective from active learning methodologies", in de Miguel González R. and Donert K. (Eds.), *Innovative learning in Europe: New challenges for the 21st Century*, Cambridge Scholars Publishing, 2014, pp. 213-244.
5. De Vecchis G., Pasquinelli d'Allegra D. and Pesaresi C., "Geography in Italian schools", *Review of International Geographical Education Online (RIGEO)*, 1, 1, 2011, pp. 9-10.
6. De Vecchis G., Pasquinelli d'Allegra D. and Pesaresi C., *Didattica della geografia*, UTET – De Agostini, Novara, 2020, pp. 320-341.
7. Droogleever Fortuijn J., Gavinelli D. and Puttilli M., "Re-imagining Europe through geography education. Introduction", *J-READING (Journal of Research and Didactics in Geography)*, 1, 9, 2020, pp. 47-48.
8. Ferretti J., "Whatever Happened to the enquiry approach in geography?", in Lambert D. and Jones M., *Debates in Geography Education*, Lexington, Routledge, 2014, pp. 103-113.
9. Giorda C., *Il mio spazio nel mondo*, Rome, Carocci, 2014.
10. International Geographical Union, "International Charter on Geographical Education", 2016, https://www.igu-cge.org/wp-content/uploads/2019/03/IGU_2016_eng_ver25Feb2019.pdf.
11. Mason L., *Psicologia dell'apprendimento e dell'istruzione*, Bologna, Il Mulino, 2021, pp. 38-43.
12. Pasquinelli d'Allegra D., "Proposals for the development of competences in geography by applying the IGU International Charter", *J-READING (Journal of Research and Didactics in Geography)*, 2, 6, 2017, pp.17-31.
13. Sachs J.D., *The Age of Sustainable Development*, Columbia University Press, 2015.
14. Smith M. "How does education for sustainability development relate to geography education?", in Lambert D. and Jones M., *Debate in Geography Education*, Lexington, Routledge, 2014, pp. 257-267.
15. van der Schee J.A., "Geographical education in a changing world", *J-READING (Journal of Research and Didactics in Geography)*, 0, 1, 2012, pp. 11-15.
16. https://www.miur.gov.it/educazione-ambientale-e-alla-sostenibilit%C3%A0.
17. https://www.un.org/sustainabledevelopment/development-agenda/.

 