Teaching Environmental Education Using an Augmented Reality World Map

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Abstract The aim of this short paper is to provide readers with a comprehensive lesson plan for elementary schools, which seeks to improve digital citizenship and competency in students and teachers, by fostering digital literacy skills through an augmented reality (AR) application. The lesson plan was developed within the framework of the "Digital, Responsible Citizenship in a Connected World (DRC)" project funded under Key Action 2: Cooperation for innovation and the exchange of good practices, part of the European Union's Erasmus+program. The DRC project aims to infuse contemporary pedagogical practices into quality lifelong learning for students and teaching professionals, including teachers, school leaders and teacher educators, across Europe. Specifically, the project aims to improve digital citizenship and competency in students and teachers by fostering digital literacy skills through education.

Keywords Environmental education · Habitats · Augmented reality · World map

1 Introduction

This short paper presents how the material and resources of the Digital Citizenship program and curricula on digital literacy [1] enhanced by the Clever Books Augmented Reality App for Geography [2] were introduced and evaluated in an elementary class of the 1st Primary School of Rafina in Greece, for teaching environmental education and, more specifically, the topic "habitats."

The aim of the intervention was to test and assess the usability of the lesson plan entitled "Habitats" within the "Communication and Collaboration" competence area of the European Digital Competence Framework for Citizens (DigComp), which offers a tool to improve citizens' digital competence [3].

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1.1 Profile of School and Students

The 1st Primary School of Rafina is a public elementary school overseen by the Ministry of Education, Research and Religious Affairs.

Number of teachers: 28.

Gender: Male 7, Female 21.

Number of students: 276.

Besides DRC, there is no other program running currently that promotes digital citizenship.

Demographics of class where workshop took place:

Number of students: 23.

Gender: Male 7, Female 16.

Age: 9 years old.

The group included students who have been diagnosed with autism, attention deficit hyperactivity disorder (ADHD) and dyslexia.

1.2 Description of the Workshop With Students

The teacher selected the "Communication and Collaboration" competence area on: interacting through digital technologies; sharing through digital technologies; engaging in citizenship through digital technologies; collaborating through digital technologies; netiquette; managing digital identity. The lesson plan entitled "Habitats" was based on the following rationale.

1.3 Grade Level—Age of Students

The workshop was for third-grade students (Class C2), aged 9–10.

1.4 Material/Resources

Although the teacher is an expert in the use of new technologies in education and the students are digital natives, the only technology available in the classroom is a chalkboard. The school's computer lab is located in another building and the process for borrowing laptops and projectors and setting them up is time-consuming. The

teacher therefore decided to use mobile devices, which students could easily bring from home, along with an offline mobile app that students could run, regardless of connectivity, to exploit the possibilities offered by augmented reality. The "Digital competences—Self-assessment grid" [4] was used to evaluate the activities.

1.5 Interdisciplinary and Constructivist Approach

Multiple disciplines, including environmental studies and language, were integrated, for an interdisciplinary curriculum approach. This was to maximize the students' ability to understand the major themes and ideas associated with Habitats.

Students would need to activate their previous knowledge from any of the disciplines, especially environmental education, in order to achieve a constructivist approach to learning and an understanding of habitats. This workshop not only integrated multiple disciplines, but challenged students constructively to strengthen their social, abstract-thinking, and creative skills. The worksheet in English can be retrieved at: http://bit.ly/2RVvsSI.

1.6 Parental Involvement

Throughout the workshop, parental involvement was widely encouraged to support and enhance student performance. Parents had the opportunity to work with their child at the annual Students' Festival to exploit the learning opportunities offered by augmented reality.

1.7 Active Citizenship

Many of the ideas, concepts and discussions associated with the workshop, such as habitat conservation, would motivate students to analyze the community they live in and hopefully in still a need for active citizenship.

1.8 Data Collection

The teacher translated the "Parent Consent Form" into Greek and distributed it to parents. Parent testimonials were recorded during the Students' Festival held at Karamanlis Park on 11 May 2019.

An "Observation Form" and a "Teacher Evaluation for Digital Literacy and Citizenship Resources for Workshops with Students" form were completed by the teacher/workshop facilitator after the workshop.

The teacher distributed a testimonial template to students and informed them that completing it was not obligatory.

The teacher took photographs of all workshop activities.

2 Findings

2.1 Use of Digital Literacy and Citizenship Resources

AR app Demonstration at the Students' Festival. The group of students led by their teacher participated in the Students' Festival held at Karamanlis Park on 11 May 2019. The students demonstrated the augmented reality application to their parents and to visitors.

Workshop Based on the Lesson Plan Entitled "Habitats". The student workshop took place on May 15 and was based on the lesson plan developed by the 1st Primary School of Rafina entitled "Habitats." The worksheets in Greek were completed by each group of students, then presented by each work group and discussed in a session that included feedback.

Workshop Based on a Lesson Plan that the Students Had Developed. The students developed their own lesson plan based on a book powered by an augmented reality app. The lesson was implemented by the students on May 30.

2.2 Course: Study of the Environment

Lesson: The little explorers and monuments of the world.

Digital Competence Area: 2. Communication and Collaboration.

Grade Level: C Time frame: 2 h.

Lesson Overview.

This lesson plan summarizes the significance and importance for the class of famous monuments. The augmented reality app helps students to learn about specific monuments.

Learning Objectives. On completion of this lesson, students will be able to:

- list and describe examples of famous monuments

- discuss the importance of conservation in relation to our national monuments.

Material/Resources. The book *Οι μικροί εξερευνητές και τα μνημεία του κόσμου* [The Little Explorers and Monuments of the World]. Publisher: iWrite. ISBN: 978–618-5218–24-9.

Lesson Activities. The students read the book and explore the monuments using the augmented reality application that they have downloaded. They can even take photos in front of their favorite monuments. Discussion follows about the importance and the preservation of world monuments.

The digital literacy and citizenship resources and, more specifically, the subject of "Environmental Education" were integrated into the curriculum.

2.3 Successes

The greatest success of the intervention was that the students were inspired to create their own lesson plan and implemented it successfully in the classroom. A community of self-directed elementary school learners with enhanced homonomy was created.

2.4 Challenges

The challenge the teacher faced was designing a five-week intervention with no technological resources available in the classroom.

This was overcome by using free resources that did not require internet access, along with the kind cooperation of parents, who gave their children permission to bring their mobile devices to school for the workshops.

The students faced the following challenges:

- Poor battery life
- Tablet/phone or app crashes.

Students were advised to bring extra devices in case they encountered technical problems, therefore there was no real inconvenience, just frustration whenever the issue arose.

2.5 Comments and Feedback

Teacher's Views/feedback. Based on the teacher's evaluation form:

- The workshop was worth completing, met her expectations and was beneficial for the students in her class.
- The resources used were of excellent quality.
- Unfortunately, the Digital Citizenship app was not available at the time the intervention was designed.
- It was very easy for the teacher to integrate the resources into her teaching practice.
- The workshop had a positive impact on the teacher. It raised her awareness of digital literacy and citizenship and of how they can be taught to young students. It also helped her to support her students to further develop their digital literacy.

Students' Views/Feedback. Students enjoyed working with the AR apps and, particularly, collaborating in groups. There were a few challenges, which they overcame easily. They also liked sharing their experience with their parents and visitors at the Students' Festival.

References

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