



## Promoting the Collaboration between Schools, Research Institutions, and Local Associations: the 2022 European Week at Liceo Copernico in Bologna as a Case Study

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### Abstract

*The international relationships and interactions developed by secondary school students during the intercultural exchanges offered by their schools are precious assets in themselves, but can be further embellished if effective and functional collaborations on common educational grounds are established between schools networks, research institutions present on the territory, and local cultural associations. The chance offered to visiting foreign students to interact, learn and collaborate with their host peers on socio-cultural and internationally-shared research topics is a way of making the experience of intercultural exchange an important moment of growth, acceptance, and awareness of similarities and differences between countries. The successful activities implemented during the European Week organized in Bologna (IT) will be presented. The European Initiative took place in April 2022 and was developed on the collaboration among three high schools (Italian, Hungarian and Belgian), researchers of three institutes belonging to the National Research Council of Italy, and the NGO who manages a Museum. The proposed activities and the topic addressed were focused on the European challenges linked to the environment and the sustainable use of natural resources from Earth. In particular, they concerned: 1) the path towards the ecological transition; 2) the critical issues and challenges associated with the exploitation of raw materials and 3) historical and socio-cultural aspects related to mining activities in the local area. The collaboration between the different sides of the knowledge triangle gave rise to the awareness increase among youngsters on the necessity of a mind-set change to go on towards a more sustainable society.*

**Keywords:** Cultural exchanges, collaboration between schools and local institutions, raising awareness, common educational grounds

### 1. Introduction

International school exchanges enable students to have new experiences and spend time with fellow foreign peers with whom they can share knowledge and approach different cultures. They are based on the principles of intercultural tolerance and mutual enrichment, providing the psychological openness necessary to interact with other cultures without losing one's own national or ethnic identity [1]. Through time short-time school exchanges have become an asset for all kind of secondary high schools, and the experience is useful also for teachers or pre-service teachers who can broaden their perspective of teaching roles and methodologies through the comparison with foreign colleagues [2].

The Liceo Copernico of Bologna [3] has a long tradition of international short-time school exchanges. In addition, it collaborates with the National Research Council of Italy (CNR, i.e. the largest public research body of the country) for the development of learning paths for students on sustainable innovation and circular economy. In 2022, in the framework of two intercultural exchanges with the Sint Dimpna college of Geel (Belgium) and the Karolyi Mihaly school from Budapest (Hungary), researchers from the local institutes of CNR decided to transform the period of these traditional exchanges into an European Week (from April 3<sup>rd</sup> to 8<sup>th</sup>), to involve students in learning activities focused on the European challenges linked to the sustainable use of natural resources from Earth, in particular on Critical Raw Materials (CRMs), essential for the energy transition [4], and some of the key concepts of circular economy as an alternative for the current linear economy. In fact, with the future global resource use of some raw materials projected to double by 2030, addressing raw



materials through the entire value chain becomes a priority as well as transferring these ideas to youngsters.

This contribution describes in detail the activities co-created with the schools and supported by CNR researchers during the European Week at Liceo Copernico in April 2022, which involved more than 50 students and teachers from three countries (Belgium, Hungary and Italy).

## 2. Methods and results

The philosophy at the base of the offered activities was to give foreign students the chance to interact, learn and collaborate with their host peers on socio-cultural and internationally-shared research topics. In this way, the experience of the intercultural exchange became an important moment of growth, acceptance, and awareness of similarities and differences between countries [5].

The steps of the learning pathway, developed during the European Week at Liceo Copernico (Figure 1) tie in with various pedagogical practices as follows:

Day 1 – Didactic Learning (Lesson & Discussion) - Students are introduced to relevant content knowledge, in the form of a didactic lesson and the attempt to involve students in exploring their personal experiences and discussing the topic.

Day 2 – Active Learning (Activity) - Students then engage in an activity to support or extend their learning and their inquiry skills.

Day 3 – Experiential Learning (Visit) - After the activity students visit a place that has relevance to the lesson and learn how the topic addressed works in the real world. Moreover, this offers the opportunity to approach the RM issues from a different point of view (e.g. Geology vs Material Science).

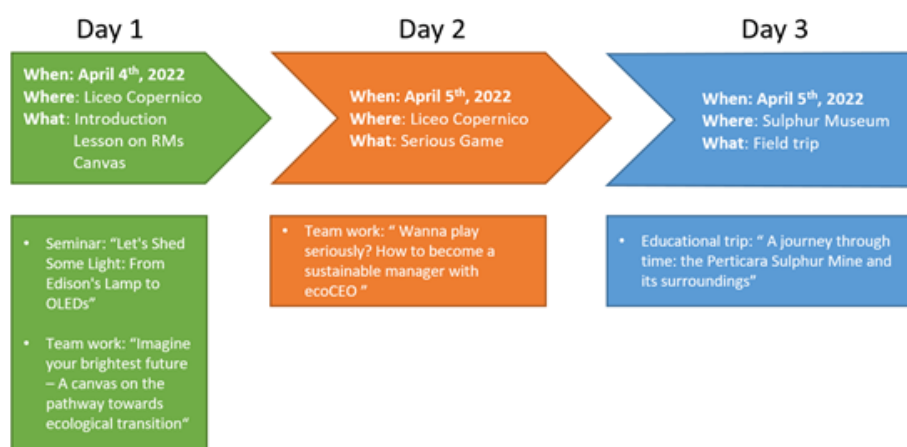


Fig. 1. Scheme of the activities proposed by CNR for the European Week at Liceo Copernico.

### 2.1 Didactic Learning: lesson on RMs and use of Canvas

At the beginning of the European Week students attended a seminar entitled "Let's shed some light: from Edison's lamp to OLED" where they could learn about the importance of some CRMs and the necessity to recycling them by starting from the history of light bulbs and their evolution through time. The intention of the seminar was to make students approach the issues relative to raw materials' exploitation and relative challenges in a simple way, using an object they all know well and deal with in their daily life. At the end of the seminar, students completed an interactive quiz to strengthen some concepts and to determine in a fun way the learning achievements (see section 2.4).

In order to support learning methods based in more horizontal interactions and problem-solving, students were then asked to fulfil a practical team-work activity (i.e. the Canvas) that engaged them in a visionary exercise in which they had to imagine their brightest future. Students were then divided in heterogeneous groups (to familiarize with their foreign peers), and given the following premise: "In



2050 the world is busy completing the process of energy transition to green and renewable resources or the world is close to zero waste objective!". They had then to collectively decide what was the idea that led to success, or how the problem was solved, and then complete a poster where they described the idea/solution (with words and graphically), how it was announced by media, and what different members of society think about it.



Fig. 2. Preparation and presentation of the Canvas allowing a visionary exercise by exchange students on Day 1 of the European Week at school.

Each group took inspiration from provided brochures on circular economy concepts/strategies and pathways for the sustainable energy transition. At the end of the allocated 45 minutes to complete the canvas, each group had a few minutes to present it to the others. In this way they coped with the difficulties that arise when concise but correct messages have to be conveyed to the public (Fig. 2).

## 2.2 Active Learning: the ecoCEO serious game

On the second day of CNR at the European Week, researchers and collaborators engaged students in a game of ecoCEO: it's your business!, a strategy business board game developed by VITO, the Wuppertal Institute, and CNR [6]. This serious game (i.e. designed for a primary purpose other than pure entertainment [7]) aims at increasing awareness and knowledge about circular economy strategies and circular business models through the added pedagogical value of fun and competition. Students had to act as managers (CEO Chief Executive Officer) of companies producing electronic goods, such as microchips, smartphones, and e-bikes, and ensure that the companies were the most eco-friendly and successful. During the game, students made decisions on which resource management, production processes and revenue models to apply, and, by combining different investments, they tried to improve the performance and profitability of their company, sometimes facing unforeseen events. By playing, students learned about the different impacts of linear and circular business strategies on the performance of a company. They also experienced as a strong and healthy company has to be resilient against external events such as policy measures, market disruptions and availability of resources (Fig. 3). In a fun way, ecoCEO taught exchange students about the relevance and the opportunities of circular strategies such as recycling, take-back systems, reuse and repair activities and product-service systems.



Fig. 3. Pictures of the gaming session with ecoCEO on Day 2 of the European Week.

### 2.3 Experiential Learning: the trip to the Sulphur Museum in Perticara, Rimini (Italy)

On the third day, students participated to a guided field trip to the site of the biggest sulphur mine in Europe, shut down in the 1960s and now turned into a mineralogical and ethnological museum [8]. In collaboration with researchers from CNR, the volunteers of the local NGO managing the museum, offered a 2-hour visit that included: 1) an overview of the geological background of the area; 2) the description of economic and social aspects linked to the presence of the mine in the territory of Perticara, and 3) a “dive” into the life and work of miners through the visit of reconstructed mine tunnels (Fig. 4).



Fig. 4. Field trip at the Sulphur Museum of Perticara on Day 3 of CNR at the European Week

During the tour, students learned the history of the mine and encountered the Earth Science professions that were involved with the identification of metal veins, their exploitation and the daily maintenance of the mine. At the end of the visit they filled a feedback questionnaire relative to this experience (see section 2.4).

### 2.4 Measure of impact and feedback from participants

Learning achievements were tested during Day 1 with an interactive quiz (Kahoot) linked to the seminar on the history of light bulbs and related CRMs' issues. 53 participants answered the 7 quiz questions with an average percentage of total correct answers of about 55% (Fig. 5a).

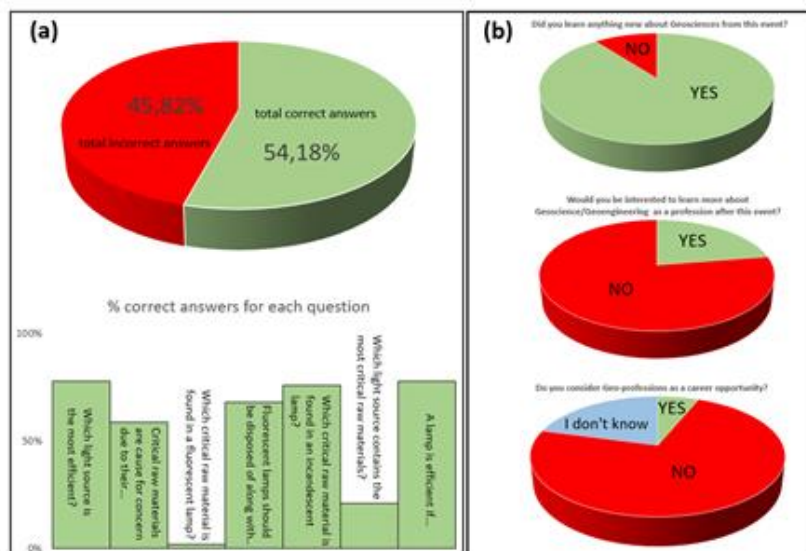


Fig. 5. (a) Results of the Kahoot quiz on CRMs (Day 1); (b) feedback during the field trip (Day 3).

Feedback from students at the end of the field trip evidenced that the proposed activities during Day 3 actually filled a knowledge gap on CRMs issues although, as predictable, they were not sufficient to increase the interest of students in Geosciences and related professions (Fig. 5b).

### 3. Conclusions

The collaboration with local institutes from CNR was particularly meaningful (and should be encouraged) because, besides strengthening the existing connection with secondary schools, it gave the latter the possibility to be supported by strategies and methodologies developed in the framework of two European projects, RM@Schools [9] and Engie [10], both funded by the European Community and with CNR as leader or partner. In addition, the collaboration between the different sides of the knowledge triangle [11] gave rise to the awareness increase among youngsters on the necessity of a mind-set change to go on towards a more sustainable society.

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