

AN INNOVATIVE ENVIRONMENTAL EDUCATION PROGRAM BASED ON AN INTERACTIVE AND ENTERTAINING APPROACH

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ABSTRACT ‘Greenopoli’ is an education program that has two main keywords: sharing and sustainability. The first relates to the teaching method, while the second to the contents. The role of the educator changes to assume the functions of ‘moderator’, first encouraging the students to discuss the topic and subsequently intervening to support the discussion or introduce new concepts. The Greenopoli moderator creates a friendly environment, provides leading questions and hints to uplift the student’s level. The whole process is facilitated when the educator communicates with enthusiasm and empathy, adding the right amount of humour, passion, and spontaneity. The use of simple eco-rap music is an innovative tool adopted by the Greenopoli method. There are no age limits for learning with Greenopoli. Life cycle thinking is introduced to illustrate to students the sequence of extraction, manufacturing, distribution, use, and disposal of raw materials, all life cycle phases concealed within an object/waste.

INTRODUCTION

‘Greenopoli’ is an innovative environmental education program based on an interactive and entertaining approach. The program has directly involved around 350 schools and more than 70,000 students, mainly in Southern Italy, from December 2014 to the present (the method was conceived in 2006). The two main keywords of Greenopoli are sharing and sustainability (Figure 1). The first keyword relates to the teaching method, while the second to the contents. Based on the Greenopoli method, the role of the educator changes to assume the functions of ‘moderator’, first encouraging the students to discuss the topic and subsequently, at appropriate intervals, intervening to support and relaunch the discussion or introduce new concepts. The Greenopoli moderator will strive to create a friendly, cheerful, and respectful environment and create a rapport with the students. The educator will provide leading questions and hints to uplift the student’s level (De Feo, 2022).



(a)



(b)

Figure 1. The environmental education program Greenopoli: a) the logo; b) the two main keywords: sharing ('*condivisione*' in Italian) and sustainability ('*sostenibilità*' in Italian).

The whole process is facilitated when the educator communicates with enthusiasm and empathy, adding the right amount of humour and spontaneity, and displaying passion for the topic discussed. The educator must avoid putting himself/herself on a pedestal (even in a physical sense) and must remain at the level of his/her interlocutors and display eagerness to learn new things, being a student among students (Figure 2a). Identifying oneself with those we address (Figure 2b) is a mandatory starting point when seeking to establish truly effective communication (De Feo, 2022).



Figure 2. An example of what literally means: a) staying at the level of his/her interlocutors; b) identifying oneself with those we address.

The use of simple eco-rap music is an innovative tool adopted by the Greenopoli method. The idea of environmental communication through rap, an activity that has been renamed 'green rapping', was conceived almost by chance, at the request of a group of students from a lower secondary school: this epitomizes the sense of the phrase 'being a student among students'. At the end of each meeting, the educator should have learned something new from his/her students. Educators working with children readily acknowledge that the students will teach you the best way to communicate with them. A green rap is set in a cappella form, using only stomping and/or clapping as a rhythmic body percussion beat such as 'We Will Rock You' by Queen. An example of how to simplify the communication of complex themes is represented by the 'Little rap of knowledge': '*Time patience passion and skills, think and rethink always pay the bills! Plan Do Check and Act, learning from mistakes is how you can react*'. The second verse of the rap clearly refers to the 'Deming cycle' based on the P-D-C-A approach. The aim is to impart a logical process of systemic thinking to children and youths, highlighting the importance of learning from one's mistakes and putting learning into practice (De Feo, 2022).

In almost five years of educational activity, several raps have been written on the issues of sustainability, waste management, etc. One of these is 'The ugly rap of waste' ('*Il brutto rap dei rifiuti*', in Italian).

'The ugly rap of waste' has two main aims: to propose a change of approach and language, passing from the concept of 'waste' to that of 'materials from separate collection', and to raise awareness on the importance of a conscious and mature participation in separate collection programs. This is the refrain of the rap inviting to the change of language:

Chuck out and throw away, sending them away. It's not so strange, it's time to change!
(*Buttare gettare li voglio cancellare. Rimettiamoci a pensare, è tempo di cambiare!*)

With the source separation process, a cardboard box or a sheet of paper is not meant to be 'chuck out' or 'thrown away' but entrusted to the waste management company for the subsequent selection and recycling processes in order to produce new materials. Change must start from words and continue with gestures. When a recyclable material is separately collected at home and then delivered

to the waste management company, the purpose is not to throw it away, but to send it to the selection and recycling processes to produce new materials.

The first verse of the rap emphasizes the inappropriate use of the synonyms of the word 'waste' which tend to give a negative connotation to the materials recovered with the separate collection:

Waste and garbage, trash and rubbish. What bad words, they have to vanish
(*Rifiuti, immondizia, pattume e spazzatura. Che brutte parole a me fanno paura*)

The second verse underlines the importance of the reduction and reuse programs, to be added to the separate collection programs:

Reduce and reuse, nothing to lose. Respect for the environment is the best enlightenment
(*Ridurre e riusare, da qui voglio partire. Rispetto per l'ambiente, pochi soldi da gestire*)

The third verse invites us to move towards a more sober development model:

Buy and consume a lot, but life is not a rot. Avoid such a shame, life is not a game
(*Compra e compra, spreca tanto e pensa poco. A questo io non credo, la vita non è un gioco*)

The fourth verse highlights the important savings that citizens can achieve with an effective separate collection program that minimizes the unsorted residual waste:

Collect and separate, fix and regenerate. Collect and separate, diminish the fee rate
(*Separa separa, aggiusta e ripara. Separa separa, la bolletta è meno cara*)

In 2017, the Greenopoli method was adopted for environmental education programs promoted by Comieco, which is the Italian Consortium for the Recovery and Recycling of Paper and Cardboard Packaging. In fact, in order to increase the quantity of paper and cardboard collected, in 2015, Comieco launched the 'Plan for South' with special investments in targeted areas (e.g., Naples, Bari, Palermo) in order to recover part of the over 700,000 tons of paper and cardboard that still (likely) goes into the unsorted residual waste. For this purpose, a rap song was written following the approach suggested by the Greenopoli method: it is the 'Unwrap unwrap rap' ('Scartascarta rap' in Italian). The rap teaches students (and their family members) how to properly separate paper and cardboard materials by avoiding the mistakes commonly committed by wrongly collecting things into the paper collection such as thermal tickets, greaseproof paper, carbon paper, plasticized paper: these materials usually go into the unsorted residual waste; whilst paper handkerchiefs and pizza cardboard usually go into the collection container for organic. Another important aspect is to invite people not to deposit paper inside plastic bags. Similar rap songs are available (and many others can be developed) for all the other recyclable materials. For instance, to catch the attention of children about the importance of separate collection and recycling, 'The green rap of Pinocchio and the talking cricket' was written. In the rap, we talk about the six main recyclable materials coming from separate collection: wood, paper, aluminium, steel, glass, and plastic. Each material has been associated with a character from the 'Pinocchio' tale: Geppetto, the Blue Fairy, the Cat and the Fox, Mangiafuoco, the Whale. Moreover, each character was reproduced with the up-cycling approach using only materials coming from the separate collection. The rap was officially presented at the Sustainability Education Festival - Earth Day 2018, at the Villa Borghese Park in Rome (Figure 2).



Figure 2. Official presentation of 'The green rap of Pinocchio and the talking cricket' at the Sustainability Education Festival - Earth Day 2018, at the Villa Borghese Park in Rome.

In 2018, Greenopoli received the national 'Environmentalist of the year' prize from Legambiente that is the most important Italian environmental association (Figure 3). The award is named after Luisa Minazzi, a citizen of Casale Monferrato in Northern Italy, a didactic director, who was an activist and ecology councillor of her city, who unfortunately died due to asbestos exposure.



Figure 3. Final ceremony of the 'Environmentalist of the year - Luisa Minazzi' award organized by Legambiente in Casale Monferrato, in the Piedmont region of Northern Italy.

In 2019, a full educational lesson of Greenopoli was transmitted on a TV channel (Figure 4a). In the same year, Greenopoli collaborated with a waste management company in the realization of a TV program with the presence of a young youtuber to reach digital native users (Figure 4b). In 2020, Greenopoli developed the 'Environment and Surroundings' ('Ambiente e Dintorni', in Italian) TV programme. The first edition of the program, fully available even on the Greenopoli YouTube channel, was developed in fourteen episodes (Figure 5a, 5b). In 2020, Greenopoli was invited to give a talk at a TEDx event to speak about its environmental education method (Figure 5c). In 2021, Greenopoli won the '2021 Sustainable and Resilient Public Administration Award' with the project 'Life cycle assessment (LCA) and environmental dissemination with the Greenopoli method' because 'the project aimed to create a new environmental sensitivity in children, teens, and adults, allowing them to understand complex concepts in a simple way'. In 2022, Greenopoli developed a video for Vietnamese lower-level schools aimed at raising awareness and curiosity among the younger generation about waste management and separate collection. In the same year, Greenopoli appeared in a program of the first channel of Italian TV (Figure 5d). In January 2023, Greenopoli was invited in the schools of Navàs, in Spain, to talk about sustainability, waste management, etc. to students from ten to nineteen years.

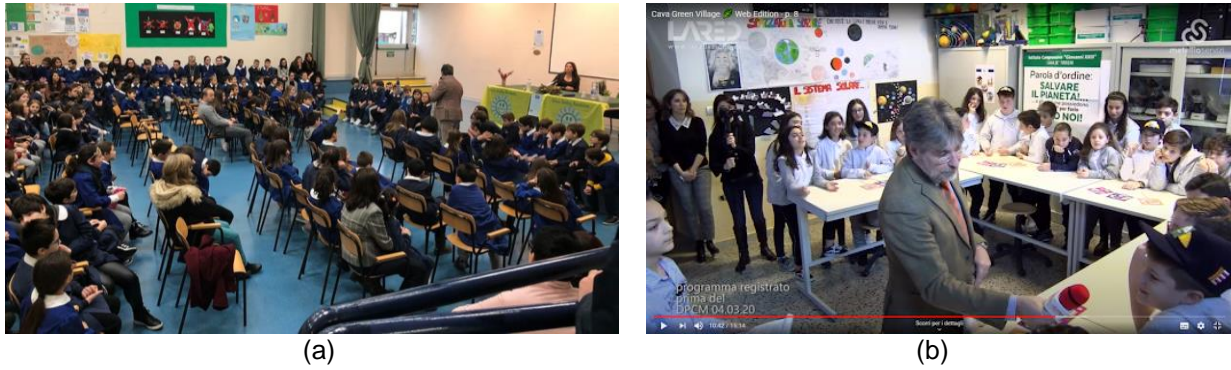


Figure 4. Some activities of Greenopoli: a) a lesson of Greenopoli on TV; b) a TV program with a young youtuber.

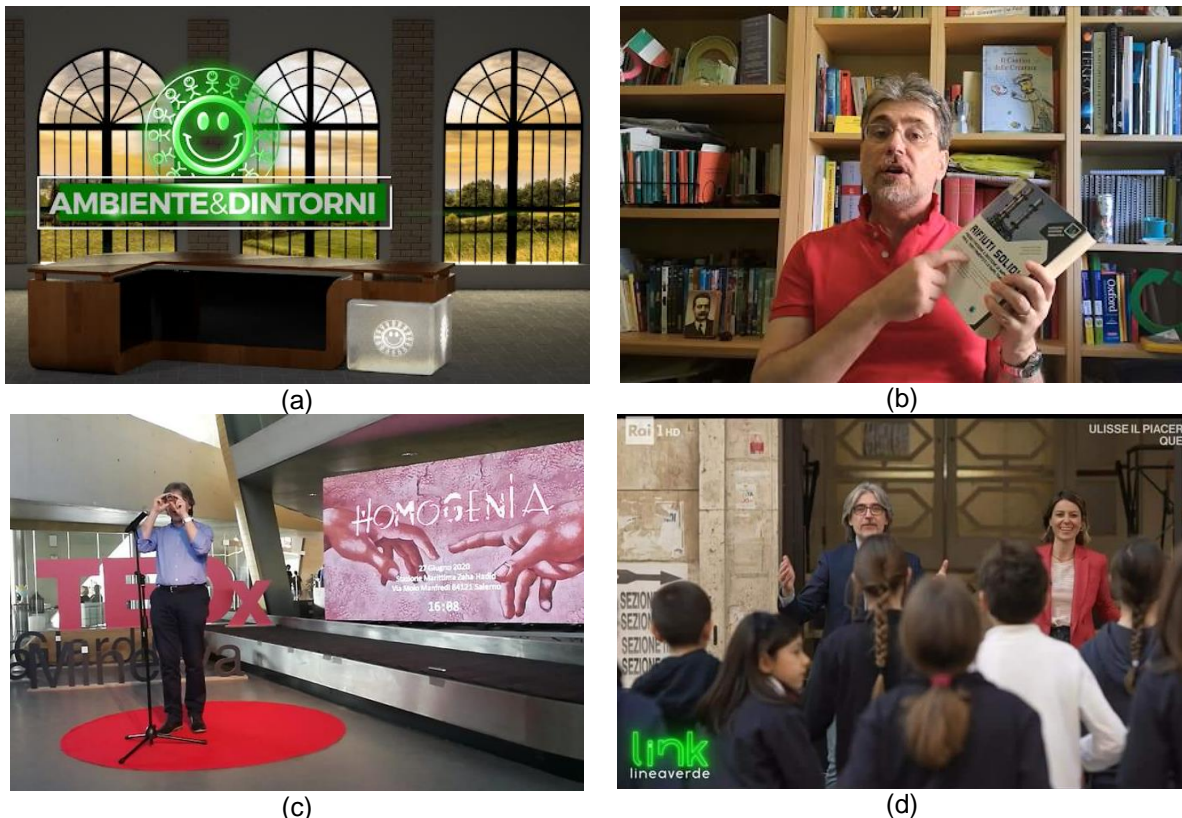


Figure 5. Some activities of Greenopoli: a), b) the TV program 'Environment and Surroundings'; c) a TEDx talk; d) Greenopoli in a program of the first channel of national Italian TV.

There are no age limits for learning with Greenopoli. For instance, in kindergartens children are engaged in tactile games with recyclable materials. They are shown how each material has a different sound, helping children to understand which separate container the waste should be collected in. The project 'Little Environmental Guards' (LEGs) was developed specifically for primary schools (Figure 6a). The underlying notion is that the adults must walk with the 'legs' of their children (environmental natives) if they wish to improve their own environmental behaviour. LEGs projects are active in several cities throughout the Campania region in Southern Italy. The project 'I, exemplary citizen', in Salerno (approx. 130,000 inhabitants) achieved a huge success on the Internet and in the newspapers, with even a website for rap music publishing an article entitled (Figure 6b): 'Rap moves the masses, a project in Salerno encourages people to take responsibility' (De Feo, 2022).



(a)



(b)

Figure 6. a) The 'Little Environmental Guards' (LEGs); b) The project 'I, exemplary citizen', in Salerno.

Life cycle thinking is introduced to illustrate to students the sequence of extraction, manufacturing, distribution, use, and disposal of raw materials, all life cycle phases concealed within an object/waste. In Greenopoli meetings, the life cycle approach is adopted in an intent to go beyond traditional viewpoints by referring to the environmental, social, and economic impacts of a product, process, or service over its entire life cycle (De Feo et al., 2019). For example, a roll of toilet paper is one of the objects used to explain the life cycle concept in a humorous way and starts by asking students the weight of a one kilogram roll of toilet paper (Figure 8). We must learn not to limit our vision of goods to their mere physical appearance, but to envisage where it has originated from and what it is destined to become. In any given product, we must envisage all the life cycle through which it was generated together with those that will follow (De Feo, 2022).



Figure 8. The toilet paper of Greenopoli in a meeting with ten years student in Navàs (Spain).

Starting from thinking on students' needs, interests, and potential ability, Greenopoli identifies three aspects of educational activities (contents, methods, and times) that have to be differentiated according to the age of students, from kindergarten to higher education (see Table 1) and develops effective methods to achieving its goals (De Feo and Faiella, 2019).

Table 1. Main aspects of educational activities on waste management according to Greenopoli framework - from kindergarten to higher education (De Feo and Faiella, 2019)

Education stage	Age of students	Content	Method	Time
Kindergarten	3-5	Separate collection, recycling	Rap songs, Storytelling, Games	45 minutes + discussion
Primary school – first two years	6-7	+ Composting	Rap songs, Storytelling, Games	60 minutes + discussion
Primary school – last three years	8-10	+ Disposal	Rap songs, Games, Internet competitions, Field trips	90 minutes + discussion
Lower secondary school	11-13	+ Life cycle	Rap songs, Games, Internet competitions, Field trips	120 minutes + discussion
Upper secondary school	14-18	+ Definitions, laws, WM systems	Rap songs, Games, Internet competitions, Field trips	150 minutes + discussion
Higher education	>19	+ Advanced concepts	Lectures, Slogan, Field trips	180 minutes + discussion

ACTIVITY IN KINDERGARTEN

With kindergarten pupils, the Greenopoli method suggests discussing only about separate collection and recycling. More complicated contents are not appropriate in the age range 3-5 years. The contents have to be given using rap songs, storytelling and games. The duration of the meetings is about 45 minutes (De Feo and Faiella, 2019).

Greenopoli green raps are very popular with kindergarten children and are very useful for capturing their attention in a light and funny way. Usually, the meetings with the little ones begin by telling the story of the ‘Three Little Wolves of Greenopoli’ (it is an overturned version of the famous ‘Three Little Pigs’) which teaches them that the wolf is not bad but is drawn as a bad animal. The goal is to start making them understand the importance of looking at things differently (De Bono, 2017). Children are involved in tactile games with recyclable materials (Figure 9). It is shown how each material has a different sound, through which pupils can understand in which container has to be collected.



Figure 9. Two moments of the teaching activities of Greenopoli in the Kindergarten: a) singing the green raps of Greenopoli; b) showing the recycling materials from the separate collection.

ACTIVITY IN PRIMARY SCHOOL – FIRST TWO YEARS

In the first two years of primary school, the Greenopoli method suggests discussing only about separate collection, recycling, and composting. The contents have to be given using rap songs, storytelling and games. The duration of the meetings is about 60 minutes. The students are all involved in the practical verification of their knowledge on separate collection and recycling. In fact, the student are directly involved in a source separation training: they receive different objects that they have to collocate in the different containers reporting the name of the fraction to be collected (Figure 5a) (De Feo and Faiella, 2019).



Figure 10. Two moments of the teaching activities of Greenopoli with the first two years students of primary school: a) the containers used during the separate collection training activity at school; b) some Little Environmental Guards of Greenopoli.

The student has to understand that there are many materials that have to be separated at home and then selected and sent to recycling or composting processes. Instead, other materials must be placed in the container for the unsorted residual waste where all the materials useful for energy recovery are collected. This step is essential to avoid that they may have wrong prejudices against Waste-to-Energy processes. From an early age, people need to be educated about systemic thinking. It makes no sense to compare the performance of two different treatment units. Performance must be compared in terms of overall management systems (De Feo and Faiella, 2019).

For this age group, but also for other primary school children, the project of 'Greenopoli Little Environmental Guards' (Greenopoli LEGs) was developed ('*PiccoleGuardieAmbientali di Greenopoli*' in Italian, with the acronym PGA). The LEGs, through Greenopoli raps, learn fundamental concepts such as compliance with the rules (crossing pedestrian crossings), energy saving (switching off lights), recycling (passing from the concepts of garbage and rubbish to the concept of materials) and water saving (consumption reduction). For the four themes, the children, under the guidance of the teachers and with the help of their parents, must create as many 'signalling discs' in recycled cardboard, similar in shape and function to those held by the traffic control officers, on which they have to draw the pedestrian crossing lines, a light bulb, a waste basket, and a tap. The four signalling discs are made using waste cardboards to highlight the importance of the creative re-use (the so-called 'up-cycling') of products at the end of their life. Having learned the basic concepts, the little guards begin to transmit the 'rules of the game' to their parents urging them to an active and enthusiastic collaboration (De Feo and Faiella, 2019).

Separate collection of waste is the only issue for which the little environmental guards are asked for a special commitment. The LEGs obtain the calendar for the separate collection of their municipality, which they learn well, and then put into practice together with their parents. On this issue, in fact, we want to achieve concrete and tangible objectives: the increase in the percentage of separate collection and the improvement of the quality of the materials for recycling. The Greenopoli LEGs projects are active in several cities of Campania region as it can be seen with a Google search on the Internet (De Feo and Faiella, 2019).

ACTIVITY IN PRIMARY SCHOOL – LAST THREE YEARS

With students of the last three years of primary school, the Greenopoli method suggests discussing about separate collection, recycling, composting and disposal. The contents have to be given using rap songs, games, Internet competitions and field trips. The duration of the meetings is about 90 minutes. An example of a possible activity on composting to be implemented at school for this age group is the project 'Grandparents for composting' developed with the Greenopoli method in Mercato San Severino, in the province of Salerno, in collaboration with the former Councillor for Environment of the Campania Region in Southern Italy (Figure 11a).



Figure 11. Two projects developed with the Greenopoli method: a) 'Grandparents for composting' in the city of Mercato San Severino in Southern Italy; b) 'I, exemplary citizen' in the city of Salerno in Southern Italy.

The project included a series of preliminary training meetings with the grandparents, with the administration of starting questionnaires, to verify their level of knowledge and their opinions on waste, separate collection and composting. Subsequently, some meetings were organized focusing on the concept of waste/material, on separate collection programs and, of course, on domestic composting. In these meetings, there was the possibility that grandparents could present 'eco-stories' at school. An 'eco-story' is a story of grandparents' childhood, when they played outdoors, stories of life in the fields, what they did for fun when they were children, when they did not spend their time indoors completely immersed and lost in chat, social networks, android, tablets, PlayStation and Xbox. It was also suggested to grandparents to take school photos of when they were small, outdoors photos, in the countryside (to be shown directly or to be scanned and shown with a PowerPoint presentation). The first meeting at school was aimed at getting to know the children, illustrating the project (what would have been done in concrete terms), a PowerPoint presentation (on the concept of waste/materials, recycling and home composting) and finally, to the administration of a starting questionnaire also for the students, obviously different from that of the grandparents (but having the same purposes). The second meeting between children and grandparents was dedicated to the construction and installation of a wire mesh composter. With the third and subsequent meetings, the practice of composting was started and developed under the careful guidance and supervision of the grandparents. The final phases of the project involved the administration of the final questionnaire with the students, of the final questionnaire with the grandparents and the organization of a final presentation of the results with the involvement of the whole local community (De Feo and Faiella, 2019).

With the project 'I, exemplary citizen', in Salerno (around 130,000 inhabitants), every primary school had the task of writing new Greenopoli rap verses starting from the refrain provided. Furthermore, the participants also had to create a choreography for rap, to sing and dance at the final event (Figure 11b). The project and the final event had a great prominence on the Internet and in the newspapers. Even a musical site that deals with rap songs has titled: 'The rap moves the masses, here in Salerno a project that pushes to be responsible' (<https://www.musicworldnews.it/rap-news/>) (De Feo and Faiella, 2019).

ACTIVITY IN LOWER SECONDARY SCHOOL

With lower secondary school students, the Greenopoli method suggests discussing about separate collection, recycling, composting, disposal, and the concept of life cycle. The contents have to be given using rap songs, games, Internet competitions and field trips. The duration of the meetings is about 120 minutes (De Feo and Faiella, 2019).



Figure 12. Activities developed with the Greenopoli method in lower secondary schools: a) Internet competition; b) participation in a green rap.

Lower secondary school students are not easy to deal with because they are in a delicate phase of changing toward teenaging. They are both environmental natives and digital natives and are particularly attracted by the use of technology and computer competitions. Therefore, competitive games involving the use of online programs to compose quizzes (e.g., Kahoot) are particularly useful (Figure 12a). Moreover, their age is very suitable for the approach that involves the transfer of content with rap songs (Figure 12b) (De Feo and Faiella, 2019).

Life cycle thinking is introduced to show students the sequence of raw materials extraction, manufacturing, distribution, use, and disposal, which is the life cycle that are hidden in an object/waste. In the Greenopoli meetings, the life cycle approach is used to go beyond traditional point of views by including the environmental, social, and economic impacts of a product, process, or service over its entire life cycle (De Feo et al., 2019).





Figure 13. School-work alternation projects conducted with the Greenopoli method in two scientific high schools in Campania (S1: Liceo 'B. Rescigno' Roccapiemonte; S2: Liceo 'V. De Caprariis' Atripalda): a) fuchsia team – S1; b) orange team S1; c) yellow team – S1; d) green team S1; e) blue team – S1; f) 'Municipal Solid Waste (MSW) management in the European countries' step in S2; g) green team – S2; h) blue team – S2; i) yellow team – S2; j) orange team – S2; k) fuchsia team – S2; l) red team – S2; m) final discussion of the project by the team spokesman in S1; n) group photo in S1; o) group photo in S2.

ACTIVITY IN UPPER SECONDARY SCHOOL

With upper secondary school students, the Greenopoli method suggests discussing about separate collection, recycling, composting, disposal, life cycle thinking, definition, laws and waste management systems. The contents have to be given using rap songs, games, Internet competitions and field trips. The duration of the meetings is about 150 minutes.

The Department of Industrial Engineering (DIIN) of the University of Salerno, in 2018 was involved in two school-work alternation projects conducted with the Greenopoli method in two scientific high schools in Campania region regarding waste management (Figure 13) (De Feo and Faiella, 2019).

School-work alternation is an innovative education method brought in by Law no. 53/2003 and disciplined by Legislative Decree no. 77/2005. It allows students to alternate periods of training in the classroom and inside companies or other hosting establishments (De Feo and Faiella, 2019).

The projects were developed with the following framework (De Feo and Faiella, 2019):

- Kick-off meeting and teamwork planning
- Introduction to the problems of multicriteria analysis
- Use and verification of Internet sources
- Research on 'Municipal Solid Waste (MSW) management systems'
- Research on 'Municipal Solid Waste (MSW) management in the Campania region'
- Research on 'Municipal Solid Waste (MSW) management in a European country'
- Final meeting about 'Municipal Solid Waste (MSW) management in the European countries'.

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The first meeting concerned the presentation between the moderator and the students. Furthermore, the moderator presented the organization of subsequent meetings in team working mode with the participants organized in different teams, each named with a colour, with the assignment of the team's notebook. At each meeting, the team had to appoint a spokesperson and a secretary. The spokesperson was the only one who could speak on behalf of the whole team. The secretary had the task of taking notes and sending the team's report by the beginning of the next meeting. The second

meeting focused on the introduction of multicriteria analysis problems with the aim of providing students with a structured way of approaching the solution of problems based on 'systemic thinking'. The third meeting involved the use and verification of information sources on the Internet with the aim of providing students with a useful tool to search and verify the goodness of information on waste management. In fact, the problem of the myriad opinions available on the Internet and on social networks regarding waste management is known, not always based on scientific evidence. In the fourth meeting, the students had one hour to conduct group research on the Internet on 'Municipal Solid Waste (MSW) management systems'. After, each spokesperson had to present the main results of their research. In the fifth meeting, the students had one hour to conduct group research on the Internet on Research on 'Municipal Solid Waste (MSW) management in the Campania region'. After, each spokesperson had to present the main results of their research. In the sixth meeting, the students had one hour to conduct group research on the Internet on Research on 'Municipal Solid Waste (MSW) management in a European country'. After, each spokesperson had to present the main results of their research. The final meeting regarded a final discussion about 'Municipal Solid Waste (MSW) management in the European countries' (De Feo and Faiella, 2019).

ACTIVITY IN HIGHER EDUCATION

With higher education students, the Greenopoli method suggests discussing about separate collection, recycling, composting, disposal, life cycle thinking, definition, laws, waste management systems and advanced concepts. The contents have to be given using lectures, slogan and field trips. The duration of the meetings is about 180 minutes (De Feo and Faiella, 2019).

The meetings must begin with a preliminary brainstorming session to verify the level of initial knowledge and to collect any prejudices on some processes such as incineration. It is clear that the meetings are easier when dealing with students of technical-scientific disciplines, but antisocial prejudices can be found even among themselves. The main objective is to help the students to think systematically and not look at the single aspect of a problem (De Feo and Faiella, 2019).

Field visits are very important because the students have the opportunity to directly touch things. A possible framework is a preparatory meeting, a field visit, and a final discussion meeting. Another scheme is a preparation meeting, a field visit, a presentation by the students and a final discussion chaired by the teacher and structured starting from the contents of the presentations of the students of the previous meeting (De Feo and Faiella, 2019).



Figure 14. Field trips with higher education students: a) Mechanical and Biological Treatment (MBT) plant of Battipaglia in Southern Italy; b) Waste-to-Energy (WtE) plant of Acerra in Southern Italy.

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