Teach in the Wild Garden

The Wild Garden
for Learning and Development

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WILD! The Wild Garden for Learning and Development

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Introduction

This methodological handbook aims to provide a complete training to the primary school teachers to better face the didactic activity in the Wild Garden. With this tool we want to support the teacher in the use not only of formal teaching, but also and above all of the non-formal and informal one, inventing new spaces for learning, which take the pupils out of the school walls to experience first-hand the natural sciences applied to the creation of the wild garden. The material, freely downloadable, will be available not only to teachers who want to undertake a path for the creation of the wild garden but also to all those teachers who want to deepen their knowledge in natural sciences with particular reference to biological aspects.

The volume is divided into two sections, plus Annexes:

1 **Natural sciences in teaching:** the first part of the book addresses scientific topics, to increase the teacher's skills in biology, ecology, botany and zoology for a good realization of the Wild Garden.

2 **Pedagogy of nature:** it is a careful pedagogical analysis of the "open air teaching", and of the relationship of children with nature, notions and strategies for classroom management in group-work and inclusive education. Focus is also placed on pupils with special educational needs, problems of socialization and attention.

The needs analysis carried out before the development of this project has shown that there are both shortcomings in terms of scientific skills and in the development of methodologies useful for the transmission of this knowledge to learners. In this volume both issues are addressed according to a logical scheme that starts from the skills to arrive at their practical application. With regard to scientific skills, an in-depth research was conducted on those really necessary for the teacher to carry out Wild Garden projects. This is to avoid bombarding teachers with too many notions with the risk that those actually useful for the purpose will be lost.

The first section is therefore characterized by a few general natural sciences notions but explained in depth especially thanks to the use of practical applications of the stated scientific assumptions. The second part of the handbook focuses on the pedagogical aspects of teaching in the Wild Garden. In outdoor natural science activities, as an object of educational action, the student is placed in a different context. The classroom where teaching activities normally take place is replaced by a part of a natural or artificial

ecosystem, such as the wild garden. In this case, the student will no longer look out the classroom window to observe a living organism, but will have the opportunity to observe it directly in nature. For the success of such an activity it is indicated that as a subject of the educational action, the teacher guides the student's attention through the carefully formulated educational messages only on those aspects of the environment, which are consistent with the content of the lesson.

We have selected concepts that are actually useful to the teacher in managing the pupils, even those with special needs, in an outdoor education context. We also exemplified possible reactions of learners in the application of these teaching tools trying to offer the teacher replies on how to manage particular situations and allow teachers to set a correct relationship, both between the pupils and with the space in which they find themselves interacting. Particular insights are those made on their applications in the Wild Garden, considering the age and individual peculiarities of the students, their desires, interests and needs, we appreciate that the following educational goals can be achieved during the formal and non-formal activities carried out outdoors.

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The natural sciences in the process of teaching

1

1.1

Wild garden as an ecosystem (variety of habitats)

Plant and animal communities live and interact in varying compositions and in distinct, often complementary relationships. These biologically diverse communities, when combined together with the abiotic (non-living) elements of the surrounding environment, such as soil, water and sunlight, form a functional system called an **ecosystem**. A **habitat** is the area within an ecosystem where an animal is able to secure the food, water, cover and space it needs to survive and reproduce. Every species has specific habitat requirements, but because there are often overlaps of habitat features within a system, there are usually multiple wildlife species that can live in a given habitat.

Ecosystem biodiversity refers to the variety of habitats within a particular area (photo by K.Szczepko-Morawiec)

The diversity of habitats in the wild garden, from hedges, walls, meadows and trees, to various types of water reservoirs (e.g. ponds), affects the diversity of living conditions, allowing the existence of various species of animals and plants (and, consequently, the growth of biodiversity). The greater the diversity of plants and animals in the garden, the more effective is the garden as an ecological system.

Biotic (living) components

Plants – vertical and horizontal structure. Vertical structure refers to layers of plants:

1. The mulch layer (humus layer)
2. The herbaceous layer (plants with green, mostly non-woody stems
3. The shrub layer or "sub-canopy" layer
4. The tree layer

The vegetative layers, their level of complexity, sustain a broad array of wildlife species. Since most of our created ecosystems are typically missing one or more vegetative layers, we can easily support more wildlife species by taking our cues from nature and choosing plants appropriate for our particular site conditions.

The horizontal structure refers to the changes that naturally occur over time in plant communities, if there are no interventions such as mowing, grazing or burning. The arrangement of these different successional stages in proximity to each other provides horizontal structure. We can improve these structures by influencing the growth of particular vegetative types that will mimic different successional stages, which in turn will support different wildlife species. For example, if we stop mowing an area, we can allow woody shrubs and trees to gradually take over and provide a forest type habitat.

We can greatly increase the wild garden's habitat potential by adding layers that improve both vertical and horizontal structure.

The plant community provides organic matter for a variety of organisms, such as bacteria and fungi, and the plants also provide food and cover for wildlife, including birds, mammals, reptiles, amphibians and insects.

Plant diversity is a principle predictor of animal diversity (photo by K.Szczepko-Morawiec).

Abiotic (non-living) components

Additional structural components will augment the available habitat for wildlife. The most common structural components include brush and rock piles, logs (dead trees), nest boxes, areas with bare soil, and water features (sources).

Brush and rock piles provide shelter for wildlife from rain, wind and snow over the course of a year. These simple constructed piles of easily found materials also provide escape cover from predators, as well as places for wildlife to raise young. Many animals seek out these constructions, to rest, find food, overwinter, or lay their eggs.

Another structural component for wildlife is a dead tree or logs. The decaying material of dead trees is host to innumerable insects and their larvae feeding beneath the bark. Approximately 30% of solitary bee and wasp's species use abandoned beetle tunnels in dead trees as a nesting site to lay their eggs.

The abundance of burrowing insects, grubs, and eggs provide a food source for birds and mammals. Birds use dead trees to hunt from, to sing from for marking their territory. Dead trees also provide a refuge for birds and hibernating mammals in winter. What is more, retaining dead trees and woody material on site will greatly enhance the habitat value for wildlife and also recycle nutrients back into the soil.

Open ground spaces are often used as shelters for variety of vertebrate and invertebrate animal species (photo by K. Szczepko-Morawiec)

Where no dead trees are present or there are few of them, we can put up nest boxes (bird house, bat house, solitary bees and wasps house) for cavity-seekers.

Bare soil is an often overlooked element in the landscape that can be useful for some wildlife species. A simple way of making the area with bare soil is to scrape away the vegetation from a patch of ground and allow it to dry out. Songbirds will use a dust bath where bare soil is available, in order to control mites and other external parasites on their skin or in their feathers. Birds also ingest grit and sand, which help to grind up food such as hard seeds. Areas of bare ground are also very important to solitary bees and wasps, because almost 70% species nest in the ground. Different locations will attract different bee and wasp species, therefore important is clearing patches on both flat ground and on slopes, particularly those that are facing south. Bare ground can also be supplemented with sand pits (a mix of sand and loam) for bees and wasps.

Bare ground are very important for nesting to solitary and social bees and wasps (photo by K.Szczepko-Morawiec)

Another structural element that is essential to any wild garden is the presence of water sources (features) providing water for terrestrial wildlife species to drink from or bathe in: this function can be performed in the garden by smaller sources like bird baths and created small mud puddles for insects, or a larger source for aquatic species to live and breed: a water garden or frog pond.

Which habitats can be recreated in a wild garden?

Habitat garden for butterflies and other pollinators: a garden designed specifically to support pollinators, like butterflies, moths, bees, wasps, beetles, flies. Each group of organisms has different requirements, therefore the plants in the garden should represent a broad spectrum of species and flowering types, and should bloom at different times throughout the season. It is essential also to provide shelter pollinator habitats from the wind with some type of cover, such as groups of shrubs or hedgerows, trees, or a wall or fence. The key to creating a pollinator-friendly garden is to try to provide pollen-rich flowers from spring right through to autumn. Creating nesting sites for bees (mining bees, digging bees, cavity-nesting bees, wood nesting bees, etc.): bare soil on a south or east-facing bank is the ideal nesting site for mining solitary bees and wasps, bees and wasps "hotels".

Garden plants provide food for many pollinators, such as butterflies and bees (photo by N.Ratajczyk)

Bird garden: for many bird species important is the vegetative elements as the herbaceous flowering layer, the shrub layer and the canopy layer (fruits, seeds, insects, spiders) and structural elements like brush piles, nest boxes and water features (food, nests, shade, protection, water). Bird bath can have a hugely positive impact for local birds - by offering both drinking water and a bathing area.

Water garden for frogs, and other aquatic species: small mud puddles for insects, shallow depression creating a mini-wetland, frog pond.

The presence of water is essential to any wild garden (photo by N.Ratajczyk)

Habitat gardening is an enjoyable way to more fully appreciate nature while improving the available food, water and cover for birds, amphibians, mammals and other wild creatures. Applying the principles of vertical and horizontal structure of plants will provide wildlife with beneficial food sources as well as much needed cover from predators, winds and sun. Also, the nest boxes, water features, brush piles and other structures will enhance the habitat's value of the garden.

Vertical and horizontal structures of plants create refuges that protect from predators, sun and wind (photo by K.Szczepko-Morawiec)

Functions of an ecosystem: ecosystem services

1.2

Human life depends on a healthy nature that provides a range of benefits, known as ecosystem services. Nature influences quality of life by providing basic life support, material goods and spiritual inspiration. Some examples of ecosystem services include: clean air, drinking water, wood, medicine plants, pollination and space for education.

Every human being relies on clean air and suitable drinking water therefore it can be estimated that 7,8 billion people need those for living. Worldwide it is estimated that more than 2 billion people depend on wood fuel to meet their primary energy needs. At the same time 4 billion people rely on natural medicines for their health care and some 70 percent of drugs used for cancer are natural or are synthetic products inspired by nature.

The ecosystem services can be expressed in monetary terms. The first attempt to do so was in 1997. Constanza et al. estimated that the global value of ecosystem services reached 33 trillion US dollars per year. The value was updated in 2014 with use of 2011 data and the same calculation method. The findings estimated the total global ecosystem services to 125 trillion Us dollars per year.

Pollination as a one of the most important ecosystem services was calculated in Switzerland. Bee colonies ensured a yearly agricultural production worth about 213 million US dollars, by providing pollination in the time from 1997 to 2006. Downscaled to one single colony, this would be an estimated production worth 1,050 USD in pollinated fruits and berries and only 215 USD for direct products from beekeeping (e.g. honey, beeswax, pollen).

Pollination is one of the ecosystem services (photo by N.Ratajczyk).

Indirect services can be connected to improvement of human health. Research shows that regular exercise or just using green or natural space reduces the risk of heart disease and of hypertension. People who frequently visit green areas experience less health problems and less stress symptoms and those living in greener environments and report fewer health complaints. There is also considerable evidence that interaction with nature bolsters mental health.

Regarding monetary terms the ecosystem services can be distinguished in four, major categories:

- **Habitat or Supporting services:** these services underpin almost all other services. Ecosystems provide living spaces for plants or animals thus maintain a biological diversity.
- **Provisioning services:** ecosystem services that describe the material or energy outputs from ecosystems.
- **Regulating services:** the services that ecosystems provide by regulating the quality of air and soil or providing flood and disease control.
- **Cultural services:** these include the non-material benefits people obtain from contact with ecosystems. They include aesthetic, spiritual and psychological benefits.

Wild gardens with high diversity of species and habitats provide many ecosystem services. One of the most important are habitat services.

Habitat services	Habitats creation	Wild gardens create habitats suitable for many different plants, fungi, and animal species. Some of them may be rare in local scale
	Maintenance of genetic, species, and habitat diversity	Wild gardens protect natural biodiversity from deterioration
Provisioning services	Herb and medicine resources	Herbal parts of wild gardens may provide many herbs used in cooking and in traditional medicine
	Flowers	Floral parts of wild gardens provide many colorful plant species during blooming season
	Oxygen production	In wild gardens increased amount of vegetation, especially trees, helps create better air condition
Regulating services	Local climate and air quality regulation	Trees and green spaces of wild gardens lower local temperature, especially during hot summers, trees purify air from pollutants
	Carbon dioxide storage and climate change prevention	As trees and plants grow in wild gardens, they remove carbon dioxide from the atmosphere by locking it in its tissues
	Erosion prevention and maintenance of soil fertility	Vegetation cover in wild gardens provides a vital regulating service by preventing soil erosion. Well-functioning wild garden supply soil with nutrients required to support plant growth
	Pollination	In wild gardens insects pollinate plants which is essential for the development of fruits, vegetables and seeds
	Biological control	Wild gardens regulate pests and diseases through the activities of predators and parasites. Birds, bats, flies, wasps, frogs and fungi all act as natural controls

	Education	Wild garden may be a perfect place for outdoor education
Cultural services	Recreation and mental and physical health	Walking in wild gardens is a good form of physical exercise and helps students to relax. The role that green space plays in maintaining mental and physical health is increasingly becoming recognized, despite difficulties of measurement
	Aesthetic appreciation and cultural and scientific inspiration	Biodiversity, ecosystems and natural landscapes have been the source of inspiration for much of our art, culture and increasingly for science

Biodiversity

1.3

Biodiversity is the diversity of all living organisms found on Earth, including in terrestrial, marine and other aquatic ecosystems, as well as in the ecological communities of which these organisms are part. This applies to intra-species diversity and diversity at the ecosystem level (Binding definition of biodiversity - adopted by the Convention on Biological Diversity in 1992). It is the basis of the functioning of ecosystems and the services they provide.

Despite the great importance of biodiversity, its loss is progressing under the influence of human interference. Biodiversity is poorer - species, races and varieties are dying out, ecosystems are being destroyed. According to the IUCN, at least 1,677 species out of 15,060 assessed by the World Conservation Union of European species are threatened with extinction, among them the most: snails, clams and fish, as well as endemic species. The number of pollinators is declining. It is estimated that one in 10 European bee and butterfly species is threatened with extinction. According to a UN report (2019), one million species are threatened with extinction, out of 8 million species estimated worldwide. According to the Report, since the beginning of the last century (1900), the presence of native species in most terrestrial habitats has decreased by 20%, and as much as 40% is threatened with extinction. amphibian species. At least 680 species of vertebrates have become extinct since the 16th century. Almost 33 percent are also at risk. coral reefs and more than 1/3 of all marine mammals.

Loss of biodiversity is jeopardizing the functioning of life on Earth. The loss of one species can have serious consequences, as everyone has a specific role in the complex structure of life, linked by food, matter and energy cycles.

Pollinators are crucial elementents in the pollination process of most arable crops (photo by K.Szczepko-Morawiec)

The biggest killers are hierarchically: overexploitation of the natural environment by humans, agriculture, urbanization, invasive species and diseases, environmental pollution, changes in ecosystems, climate change, disturbance, transport, energy production. Many scientists describe modern times as “the sixth great extinction of species” or “the sixth catastrophe”.

International legal regulations protect biodiversity. For example, the Convention on the Protection of Biological Diversity (1992), which aims to protect biodiversity at three levels of the organization: genetic, species and ecosystem, and their prudent use and fair sharing of benefits. The goals are achieved through: environmental identification and monitoring, in-situ and ex-situ conservation, protection of traditional ways of using natural resources, beneficial for biodiversity, and traditional folk knowledge favouring conservation. The protection of endangered species is served by the CITES Convention on international trade in endangered species of wild fauna and flora, which aims to: protect wild animals and plants that are excessively exploited by humans because of and consequently endangered, counteracting illegal trade in currently not endangered species and protecting geographically isolated populations. In total, the list of this convention currently includes 35,500 species, of which about 5,600 are animals and the rest are plants.

The protection of biodiversity is also supported by European regulations (the Birds and Habitats Directive) and numerous EU and national strategies and policies.

A way to increase and preserve biodiversity in local conditions are small initiatives, such as urban meadows and wild gardens. This is important especially in urbanized conditions that pose a threat to biodiversity. Urbanization has an impact on the fragmentation and limitation of habitat areas. Such "natural" gardens can be an element of the green and blue infrastructure of cities for the preservation and enhancement of biodiversity, because they are a refuge for many species of fauna and flora. They form a mosaic of various habitats (meadows, stones, ponds, shrubs, trees). They play the role of green islands complementing ecological corridors. This may be relevant, for example, to the population of bumblebees and hoverflies. They are also characterized by a higher floristic diversity compared to lawns; therefore, they favour a greater number of invertebrate species, including pollinating insects, through a rich food base. Wild gardens are characterized by multi-season flowering. Biodiversity can be supported by leaving fruit as a nutritional base for other groups of organisms throughout the year. Floristically rich wild gardens provide more flower nectar and pollen obtainable by insects. The role of wild flowers in creating a bee-friendly landscape is significant here. Plants such as geranium, sage, wormwood, thyme, thyme, whitefish, or perennial ryegrass secrete phytocides with antibacterial and fungicidal properties - which has an impact on human health.

The lack of mowing during the lockdown of the Covid pandemium has revealed the biological potential of cities (photo by. N.Ratajczyk)

The idea of a wild garden is based on natural habitats and native species. There are two approaches to their setting up and use. The first approach is based on the lack of human activity and the spontaneous appearance of plants (nature has its own rules) which, however, takes time and leads towards the forest. The second approach involves more work and human activity for the wild garden. Planting is directed in accordance with a given habitat, which promotes biodiversity. Native species are preferred. According to Łukasz Łuczaj - a promoter of wild gardens in Poland, in a wild garden we should follow the principle of cyclicality - observing the natural rhythm of nature, planting new plants

and seeing how they are doing. Diversity will be favoured by minor disturbances leading to the creation of new habitats, for example the presence of stumps and molehills. We will maintain a natural wild garden by removing plants from invasive species.

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Native, alien and invasive species

1.4

The presence of geographically alien species threatens the native flora and fauna. The EEA reports that there are more than 10,000 alien species in Europe, of which around 15% have a negative impact on nature and economic losses, 163 of them are invasive and therefore their presence in the wild garden is not recommended. Despite this, they are used in gardening, for example due to their aesthetics, viewing and utility values. The code of good practice in horticulture, however, draws attention to the fact that the intensive development of invasive plants can destroy a valuable natural habitat and its restoration will be labor-intensive and costly.

Rudbeckia fulgida – alien garden species that originates from Northern America (Photo by N.Ratajczyk)

Black locust - a species of Mediterranean origin is an invasive alien species in the continental zone (photo by N.Ratajczyk)

Threats to species occurrence

1.5

There are few places left on the planet where the impact of people has not been felt. We have explored and left our footprint on nearly every corner of the globe. As our population and needs grow, we are leaving less and less room for species. The key threats to biodiversity — habitat change, pollution, over-exploitation, IAS (Invasive Alien species), and climate change — continue to exert pressure causing loss of species and habitats and resulting in ecosystem degradation and weakening ecosystem resilience. The major threats to loss of biodiversity include:

1 **Habitat change:** including loss, fragmentation and degradation. For example, through fragmentation of the rural landscape because of urban natural and semi-natural habitats due to land-use change is a main pressure sprawl and grey infrastructure developments; homogenisation and loss of habitat caused by agricultural intensification and land abandonment, and intensely managed forests.

Habitat destruction: filling in wetlands, dredging rivers, mowing fields, and cutting down trees, cities expansion, land conversion for development. Freshwater wildlife are most impacted by pollution. Pollutants such as untreated sewage, mining waste, acid rain, fertilizers and pesticides concentrate in rivers, lakes and wetlands and eventually end up in estuaries and the food web.

Habitat fragmentation: Much of the remaining habitat has been cut up into fragments by roads and development. Housing developments, roads, office parks, strip malls, parking lots and industrial sites continue. Aquatic species' habitats have been fragmented by dams and water diversions. These fragments of habitat may not be large or connected enough to support species that need a large territory where they can find mates and food. The loss and fragmentation of habitats limits development of migratory species to find places to rest and feed along their migration routes.

Habitat degradation: pollution, invasive species, and disruption of ecosystem processes (such as changing the intensity of fires in an ecosystem) are some of the ways habitats can become so degraded, they no longer support species survival.

2 **Climate change and climate change-driven adaptations:** the most striking evidence of a climate change trend is data that show a relatively rapid and widespread increase in temperature during the past century. Europe has warmed more than the global average. The annual average temperature for the European land area up to 2008 was

1.3oC above pre-industrial levels, and for the combined land and ocean area 1oC above. Considering the land area, nine out of the last 12 years were among the warmest years since 1850. High-temperature extremes like hot days and heat waves have become more frequent, while low-temperature extremes (e.g. cold spells, frost days) have become less frequent in Europe. The average length of summer heat waves over Western Europe doubled over the period of 25 years and the frequency of hot days almost tripled. The annual average temperature is projected to rise this century by 1-5.5oC (best estimate) with the largest warming over eastern and northern Europe in winter, and over south-western and Mediterranean Europe in summer. High temperature events across Europe including night temperature extremes are projected to become more frequent, intense and longer this century, whereas winter temperature variability and the number of cold and frost extremes are projected to decrease further. Increasing impacts from climate change are already affecting species' distribution, range and interaction and are projected to become a more significant threat in the coming decades. Climate change will also interact with and exacerbate other threats.

3 **Changes in water distribution:** global sea level has increased by 10 cm over the past century, and the rate of increase is accelerating. Climate change causes sea level rise in two ways: ocean water is expanding as it warms, and land-based ice in glaciers and ice sheets is melting. Sea level rise has been happening even faster than scientists anticipated a few years ago. If recent projections are accurate, 2 to 3 C warming could bring about three feet of global sea level rise by 2100, displacing approximately 56 million people in 84 developing countries around the world. Coastal habitats also face major changes as low-lying areas are inundated with saltwater. Sea-level rise will inundate beaches and marshes and cause erosion on both coasts, diminishing habitat for birds, invertebrates, fish, and other coastal wildlife. Declining sea ice is one of the most visible signs of climate change on our planet. Since 1979, Arctic sea ice extent has declined by more than 30 percent. Recent observations indicated the ice is thinner and much younger (less multi-year ice) than it used to be. The massive areas of ice floating on ocean waters play an important role in regulating our climate, by reflecting some sunlight back to space, and in the life cycles of many polar species, such as polar bears, seals, and walruses. As warmer air is able to hold more water vapor nearly all regions are experiencing more heavy rainfall events.

Acidification of oceans: the ocean absorbs a large amount of carbon dioxide that fossil fuel burning has pumped into the atmosphere, slowing the rate of climate change. The pH of surface seawater has decreased by 0.1 units since 1750 and is projected to drop another 0.5 units by 2100 if no action is taken to curb fossil fuel emissions. These changes reduce the number of species which cannot adapt to acidification of oceans.

Loss of wetlands: higher temperatures will lead to drier conditions in the wetlands – one of the most important breeding areas in Europe. In the context of the rural and countryside areas ponds, small lakes, park lakes or rivers are also affected, even in the higher scale than bigger areas. This results in the disappearance of the whole ecosystems or migration of the organisms living in these ecosystems.

4 **Invasive species and disease:** higher average temperatures and changes in rain and snow patterns will enable some invasive plant species to move into new areas. Insect pest infestations will be more severe as pests such as mountain pine beetles are able to take advantage of drought-weakened plants. Pathogens and their hosts that thrive in higher temperatures will spread to new areas. The accelerated establishment and spread of IAS is not only an important driver of biodiversity loss, but also causing considerable economic damage to agriculture, forestry and fisheries worth billions of euros per year. Europe faces an increasing trend of new IAS across all environments. Invasive alien species are species that are introduced, accidentally or intentionally, outside of their natural geographic range and that become problematic. They are often introduced as a result of the globalisation of economies through the movement of people and goods, for instance via shipping, consignments of wood products carrying insects, or the transport of ornamental plants to new areas. Invasive alien species lack natural predators in their new environments, allowing them to quickly increase their abundance and spread. They can carry diseases, outcompete or prey on native species, alter food chains, and even change ecosystems by, for example, altering soil composition or creating habitats that encourage wildfires. These impacts can lead to local or global extinctions of native species and eventual ecological devastation. IAS can also have marked socio-economic impacts. The European Union (EU) experiences annual damages worth EUR 12 billion as a result of IAS effects on human health, damaged infrastructure, and agricultural losses.

5 **Over-exploitation of natural resources:** in particular through fisheries in the marine environment. Encouragingly, some **pollution pressures** have decreased such as the nutrient enrichment of European waters and the balance of nitrogen found on farmland. However, the level of nitrogen still substantially exceeds ecosystem eutrophication limits in most of Europe.

6 **Other main pressures recognized by Institute for European Environmental Policy** (IEEP) are causing ongoing declines in biodiversity include:

- agricultural abandonment or intensification of semi-natural grasslands and other semi natural habitats;
- intensive management of arable and improved grasslands, and loss of marginal non-farmed habitats;
- logging or old-growth forest and/or intensive forest management;
- pollution of rivers and lakes, and in-river and marginal habitat changes, river impoundments etc;
- airborne eutrophication of sensitive habitats due to N deposition;
- marine pollution and marine seabed impacts from fishing and extractive industries;

- habitat loss and fragmentation from built infrastructure;
- invasive alien species;
- illegal killing & unsustainable exploitation;
- disturbance due to recreation etc.

Threat status of EU species and biodiversity

Constant habitat loss, diffuse pollution, over-exploitation of resources, and growing impacts of invasive alien species and climate change contribute cumulatively to loss of biodiversity and the degradation of ecosystems. Although much is still unknown when it comes to the complete status and trends of European biodiversity. Nonetheless, available information on selected species, habitats and ecosystems across Europe give cause for concern. Under the Habitats Directive, the assessment for 2007–2012 shows that a high proportion of species assessments (60%) and habitat assessments (77%) remain in unfavourable condition. There has been a dramatic **decline in grassland butterflies of almost 50%** between 1990 and 2011 with no sign of recovery. **Europe's common bird populations have declined by 12%** since 1990 (common farmland birds have declined by 30%). Encouragingly, some populations of European bats and large carnivores appear to have recovered to some extent from past declines, demonstrating positive results of conservation action and unplanned changes such as land abandonment.

Golden ground beetle is a rare invertebrate animal species (photo by A.Morawiec)

Group of animals affected	Effect of the destructive activity	Cause
Reptiles	Approximately one fifth of reptiles are considered threatened in Europe and a further 12 % are considered near threatened. The majority of threatened and near threatened reptile species, all critically endangered species and the vast majority of endangered and vulnerable species are endemic to both Europe and the EU.	Habitat loss, fragmentation and degradation are the greatest threats to reptiles in Europe.
Butterflies	Approximately 7 % of butterflies are considered threatened in Europe and a further 11 % are considered near threatened. Two butterfly species have become regionally extinct in recent years (*Aricia hyacinthus* and *Tomares nogelii*).	The main current threat is the loss of their habitats or habitat connectivity due to changes in agricultural practices (intensification or abandonment).
Dragonflies	Approximately 16 % of dragonflies are considered threatened in Europe and a further 13 % are considered near threatened.	The main current threat is desiccation of their habitats.
Amphibians	More than 20 % of the amphibians found in the EU are considered threatened and a further 18 % are considered near threatened. All amphibian species considered threatened (critically endangered, endangered or vulnerable) at EU level are endemic to the European continent and are found nowhere else in the world.	Habitat loss, fragmentation and degeneration are the most significant threats to amphibians in Europe.
Mammals	Nearly one in ten of terrestrial Europe's mammal species are threatened and a further 11 % are close to qualifying for threatened status. Two European mammal species have become globally extinct since AD 1 500 (the aurochs *Bos primigenius* and the Sardinian pike *Prolagus sardus*) and a third species is regionally extinct (the grey whale *Eschrichtius robustus*).	Habitat loss and degradation is the greatest threat to terrestrial mammals in Europe, whilst the main threat to marine mammals are accidental mortality, pollution and over-exploitation.

How to combat habitat loss: combat habitat loss in your community by creating a wild garden or other new habitats to **stimulate biodiversity** near your home, school, or business. Plant native plants and put out a water source so that you can provide the food, water, cover, and places to raise young that wildlife need to survive.

The main EU target of 'halting the loss of biodiversity and the degradation of ecosystem services' by 2020 remains a serious challenge especially in regard to certain groups of animals which include butterflies, bees, dragonflies, reptiles and small mammals. All these animals and plants survival may be organised by creating small "islands" on the map of urbanized cities to create a niche for their development in a complex net of ecological relations. Wild gardens with a variety of plants, flowers, old species of vegetables and fruits supported by proper maintenance is a tool for education and biodiversity facilitation.

Local vegetable and herb gardens are being built in many cities (photo by N.Ratajczyk)

The pedagogy of nature

2

2.1 The educational purposes of the "open air teaching" process

In outdoor natural science activities, as an object of educational action, the student is placed in a different context. The classroom where teaching activities normally take place is replaced by a part of a natural or artificial ecosystem, such as the wild garden. In this case, the student will no longer look out the classroom window to observe a living organism, but will have the opportunity to observe it directly in nature. For the success of such an activity it is indicated that as a subject of the educational action, the teacher guides the student's attention through the carefully formulated educational messages only on those aspects of the environment, which are consistent with the content of the lesson.

Considering the age and individual peculiarities of the students, their desires, interests and needs, we appreciate that the following educational goals can be achieved during the formal and non-formal activities carried out outdoors, while applying student-centered teaching strategies:

- creating general culture by learning the correct name of organisms in a natural or landscaped ecosystem, knowing the external composition of plants and ani mals in an ecosystem, the relationship between the composition of organisms and the environment, the adaptation of organisms to certain habitats, the different relationships between the organisms of an ecosystem;
- creating adequate ecological beliefs and behaviors necessary for the training of students in environmental protection activities;
- training in intellectual work techniques (for example, acquainting students with the specifics and requirements of the observation and experimentation technique), etc.

Suitable teaching methods to be used in activities with ecosystems arranged and cared for by students

2.2

2.2.1. Carefully observing the plants and animals

Brief description of the teaching method

Observation is one of the teaching methods frequently applied in formal and non-formal activities carried out with young students in order to know and explore the world around them. Through this method, "the students perceive directly, actively and systematically the objects and phenomena of surrounding reality, in order to better know their essential traits; they describe and explain the acquired data by reference to the known notions; they integrate the new knowledge into the overall knowledge already assimilated" (Todor et al., 1988). Students explore often the environment, because it favors "a multimodal perception, obtained by multi-sensory channels, and the data obtained are subjected to personal reflection, the subject being no longer obliged to necessarily follow the thinking way of an adult" (Cerghit, 2006).

Observation carried out by the students on organisms and on various natural processes and phenomena can be short or long or can be repeated.

In short-term observations, carried out during a single activity, students can identify characteristic features of some plants or animals at a certain stage of their development. These can be done both with the naked eye and with the help of a magnifying glass or a microscope.

Long-term observations take place over several weeks, months or even a calendar year. Within this period students can capture the transformations that take place in the appearance of plants or animals depending on certain environmental factors.

Repeated observations are made during experiments, in order to verify a hypothesis.

Short and long-term observations are the most frequently applied in primary school education. These should be guided by the teacher through questions or worksheets. "Only this way, guided step by step, the students will reach the results expected to be obtained from the process of observation. By applying this method, the teacher will follow the gradual development of the spirit of observation to students" (Petruța, 2016).

In order for students to be supervised and guided to correctly observe the different organisms in their living environments, the teacher should carry out the observation activity with a group of 8 to 12 students as a non-formal activity. The results obtained by the students can be presented to the whole team, during the formal activity carried out in the classroom of which the group involved in the observation is part.

In the case of independent observation on the basis of a worksheet to be completed by students individually or in groups, the teacher must be placed in the wild garden in a position from which he can see what each student is doing. Sometimes, so that students do not damage the living material that is observed out of their desire “to see it better”, a second teacher or a parent who will act as a supervisor may be invited to participate in this activity. The teacher will pay special attention to students with different disabilities, asking them to solve easier work tasks adapted to their physical and intellectual possibilities (marked with * in the worksheet). These students will be helped either by the teacher, when the work tasks are solved individually, or by a colleague, when working in pairs.

When the activity is frontal, the teacher guides the observation of different organisms with the help of conversation which is sometimes accompanied by demonstration and explanation of different aspects observed.

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The title of the teaching activity

Spring/summer/autumn scent in the wild garden (short-term observation)

Grade level	Primary education
Central idea	Studying the component parts of the plant/plants in the garden
Teaching methods	Observation, conversation, explanation
Materials	Natural material, worksheets, magnifying glass
Forms of activity	Individually, in groups

Description of activities

Depending on the season in which the short-term observation of the existing plants in the garden is made, the teacher will choose the adequate name of the activity carried out with the students. Also, depending on the number of plant species that are in bloom at a time in the garden, as well as the individual and age particularities of the students and the organization of the group of students, the teacher can apply one of the following activities:

A Observation of a flowering plant/of two flowering plants

B Observation of several flowering plants

A. Observation of a flowering plant/of two flowering plants

(In - Out - In)

Grade level

1th and 2 nd grade

Estimated time

15 - 30 minutes

Objectives

- to identify the species of flowering plants in the wild garden
- to correctly mention the organs of the observed plant species
- to specify the particularities of the parts of the plant species observed with the naked eye and with a magnifying glass

In

In class, the teacher will inform the students about how to carry out the observation activity (IN - OUT - IN). Next, he will mention that the students will have to identify the plant / plants that bloomed in the school garden, to observe carefully the component parts of it, in order to be able to characterize them correctly. The teacher will distribute the worksheets to the students, will ask a student to read its contents and will discuss it with the whole group of students involved in the activity (8 to 12 students). She/he will specify the fact that the forms will be completed independently and individually, and the data regarding the underground vegetative organs will be completed later, in class. Given the fact that at this age no keys are used to determine plant species, the teacher will distribute to students 5 images, in the form of tokens, representing garden plants that bloom in spring. These images will also be found in the table header of the worksheet. The teacher makes the choice of the plant / plants to be observed and of the species presented in the images. At the end of the class discussion, she/he will warn the students about their behavior in the wild garden. The teacher will also prohibit students with pollen allergy, asthma and other respiratory diseases from smelling the flowers of the observed plants.

Out

Accompanied by the teacher, students will move through the garden to locate the plant / plants that are in bloom. If only one place is identified where there is the same flowering plant, then students will observe the species in turn and they will also use the distributed images, they will then complete the worksheet with the data obtained during the observation. If two places are identified where there are different species of flowering plants, then the group of students will be divided into two subgroups. The first subgroup will observe one of the plant species, and the other students will consider the second species. Subsequently, the two subgroups will change the place of observation in order to complete the worksheet with data on both species of flowering plants.

In

After completing the observation of the flowering plant species in the wild garden, the observation activity will continue in the classroom. Here the students will have at their reach some samples (the minimum necessary to carry out the observations) of the observed plants, available and taken from the garden, to see the underground tuple and their root, both with the naked eye and with the help of a magnifying glass. The data obtained will be recorded by students in the worksheet.

After solving all the tasks, the results will be discussed with the whole group of students, and the conclusions regarding the parts of the plant / plants observed and their characteristics will be communicated to all students in the class, during the classes when the plants are studied.

N.B.: it would be advisable for the wild garden to have a specially arranged place where students can fill in the worksheet and also observe the underground organs of plant species. In this case, the structure of the activity is: **IN - OUT**.

Worksheet

Name ----------

Grade ----------

Date ----------

1 If you identify flowering plants in the wild garden, note **X** in the table next to them. If you identify, with the help of the images on the given chips, other plants that have emerged but have not yet flowered, write **X?** in the table. If you are not sure about the existence of the plant in the wild garden, put down **?**.

Requirements for the observed plant *					
Popular name of the plant **					
The stage of development of the plant **					

* the teacher will have to select the plants he wants the pupils to observe, with regard to those present at that time in the wild garden, and put in the right columns the corresponding photos.

In order to develop the spirit of observation and attention of childrens, the teacher will include in the worksheet a plant specie that does not exist in the wildgarden.

** work tasks are also solved by students with different disabilities.

2 For each component of the plant (s) observed, indicate in the table the **color** and **shape**. To observe the root and underground stem of the plant / plants, remove soil debris with a brush. Look at them with the naked eye, then with a magnifying glass. Write in the table what you noticed. Smell of the plant flower and mention in the table if it has a fragrance.

The observed plant		
Components of the plant observed above ground (aerial) *		
Characteristics of the aerial parts of the plant		
Component parts of the plant existing in the soil (underground) *		
Characteristics of the underground parts of the plant		

* the teacher will have to select the plants he wants the pupils to observe, with regard to those present at that time in the wild garden, and put in the columns below the corresponding photos .

B. Observation of several flowering plants

(In - Out - In)

Grade level

3rd and 4th grade

Estimated time

60 to 100 minutes (depending on the number of plant species observed)

Objectives

- to recognize the species of flowering plants in the wild garden
- to correctly indicate the organs of the observed plant species
- to describe the parts of plant species observed with the naked eye and magnifying glass

In

This way of organizing the activity with the students can be chosen when there are several species of flowering plants in the garden. For example, in March or April, when they can observe the wild daffodil, the pansy, the lilac, the hawthorn, etc. Knowing in advance the species of flowering plants to be observed by the students, the teacher will place their images in the table header of the first work task. The activity will be carried out in a similar way to the one mentioned in option **A**. The teacher will announce the objectives to be followed, will distribute and discuss the worksheets and will specify that they will be completed independently and individually or in pairs. She/he will warn students with pollen allergy, asthma and other respiratory diseases not to make the observation with the help of smell. All members of the group will be informed on how to behave in the wild garden.

Out

Accompanied by the teacher, students will move through the garden to locate the plants that have bloomed. Depending on the number of places where species of flowering plants are, the activity will be organized with the group of students (8 to 12 students). If one or two places with flowering plants are identified, then the worksheets will be filled in individually, and if there are three or four places, then the worksheets will be done in pairs. In order to be able to observe and characterize all the flowering plants by the students, in the last three mentioned cases, the subgroups will rotate. Students will put down on the worksheets the characteristics of the aerial parts of the observed plants, followed by the identification through observation of the particularities of the underground vegetative organs in the classroom or in a special place arranged in the wild garden.

In

In the case of herbaceous plants, the teacher will distribute to the students some specimens taken from the garden, to observe their root and underground stem. In the case of woody plants, trees and shrubs, she/he will provide students with different images of their roots. The observations will be made both with the naked eye and with the help of a magnifying glass. At the end of the observation activity, the way in which the students filled in the worksheets will be discussed and the conclusions regarding the parts of the observed plants and their characteristics will be established. These will be communicated to all students in the class, during the lessons in which the vegetative and propagating organs of plants are studied. At the end of the activity, the plants observed in class will be placed in a vase of water. If they wither until the next day, in order to recover, their underground stem and root will be removed and placed in the same water vase.

Worksheet

Name ----------

Grade ----------

Date ----------

1 If you recognize flowering plants in the wild garden, fill in the table below the popular name of the plant observed and what kind of plant it is (herbaceous plant, woody plant - tree or shrub).

Observed plant *						
Popular name **						
The type of plant						

* the teacher will have to select the plants he wants the pupils to observe, with regard to those present at that time in the wild garden, and put in the right columns the corresponding photos.

** work tasks are also solved by students with different disabilities.

2 To identify as many characteristics of each part of the observed plant, use as many senses as possible: seeing - to determine the color and shape; feeling - to perceive the appearance (smooth, rough) and smelling - to identify which components of the plant are fragrant. To observe the root and the underground stem of the plants, remove the soil debris with the help of a brush. Look at them with the naked eye, then with a magnifying glass. Write in the table what you noticed.

The observed plant *				
Parts of the plant observed above ground (aerial) **				
Characteristics of the aerial parts of the plant				
Component parts of the plant existing in the soil (underground) **				
Characteristics of the underground parts of the plant				

* the teacher will have to select the plants he wants the pupils to observe, with regard to those present at that time in the wild garden, and put in the columns below the corresponding photos.

** work tasks are also solved by students with different disabilities .

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The title of the teaching activity

Are all plants non-perennial? (long-term observation)

Grade level	1th and 2 rd grade
Estimated time	4 to 5 months
Central idea	Knowing the life cycle of some flowering plants
Objectives	• to highlight the growth of the observed plant and to make measu rements with the help of the ruler over a certain period of time • to indicate the date of appearance of certain organs during the development of the observed plant
Teaching methods	Observation, conversation, explanation
Materials	Natural material, worksheets, ruler
Forms of activity	In pairs
Description of activities	In order to involve as many students (12 students) in making the observation, the activity can be carried out with a subgroup of students only in the classroom, and with another subgroup in the wild garden. The other students of the class to which the group involved in the observation belongs will attend the activity carried out by their colleagues. It is up to the teacher to choose the species of plants that will be observed by students.

In

In the classroom, the teacher will inform students about how to carry out the observation activity (**IN - OUT** and **IN**). He will further specify that students will have to observe over a longer period of time the transformations that take place in the appearance of a plant, as a result of its growth and development processes. The teacher will distribute the worksheets and discuss their contents with the students. He will organize the subgroups of students, will discuss with the students about the plants to be observed in the classroom (annual and perennial plants) and in the wild garden (annual and perennial plants). Thus, among the plants that can be observed by both subgroups we mention the following:

- annuals: basil, starflower, pimpinella, etc.
- perennials: daffodil, violet, red lily, corn marygold, lilac etc.

In the selection of the species, it is always recommended to choose the native ones, with special attention to those mentioned in the "Educational proposals". If it's useful to use cultivated species for the observations to be carried out, it is recommended to proceed with the planting in pots, in order to avoid that any invasive alien species may colonize the wild garden.The bulbs of biennials will be planted in the fall by the teacher or by students under the teacher's guidance, so that the plants sprout in the spring of the following year and can be observed until the end of the school year.As germination in seed-bearing plants and bulbous plants is more difficult to observe in the wild garden and in the classroom, these organs being covered with soil, the observations will be made from the moment the young plant emerges.

In/Out

The teacher has three possibilities to carry out the activity. Given that certain plant species can be grown and observed both in the classroom and in the wild garden, the teacher will form three pairs of students in each subgroup, who will observe the same three plant species (among those available in the wild garden). If the teacher chooses to observe several species of plants, then the pairs that will observe in classroom will study certain plants and those that will follow the development cycle of some plant species in wild garden, will study other plants. The teacher can also choose a pair from both subgroups to pursue the growth and development of the same plant, and the rest of the pairs to study different species. To correctly fill in the data requested in the tables, the teacher will guide the observation activity both in the classroom and in the wild garden.

In

At the end of the observation activity, the data collected and noted in tables by the students of the two subgroups will be discussed and analyzed. If the same plant species have been observed in the classroom and in the wild garden, then it will be possible to make a comparison on their height and the date of appearance of the different organs. Then, the conclusions regarding the growth of the observed plants and their stages of development will be established.

Worksheet

Name ----------

Grade ----------

Date ----------

1 Measure every week for three months using the ruler the height of the plant observed. Write down the data in the table

The observed plant	
Date of observation/ height (cm)	
Date of observation/ height (cm)	
Date of observation/ height (cm)	
Date of observation/ height (cm)	

2 Notice every day the transformations that occur in the appearance of the plant. Write the data in table A, if you studied a herbaceous plant, or in table B, if you followed the development of a woody plant

Table A

The observed plant	
Date of emergence of the young plant	
Date of appearance of the leaves	
Date of appearance of the buds from which the flowers will form	
Date of flowering	
Date of appearance of the fruit (s) with seeds	
Date of ripening of the fruit (s) with seeds	
Date of wilting of the plant	

Table B

The plant observed	
Date of budding	
Date of appearance of the leaves	
Date of appearance of the buds from which the flowers will form	
Date of flowering	
Date of appearance of the fruit (s) with seeds	
Date of ripening of the fruit (s) with seeds	
Date of leaf fall	

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The title of the teaching activity

Wild garden animals (short-term observation)

Grade level

Primary education

Estimated time

15 minutes

Central idea

Knowing the living environment and the component parts of a garden animal

Objectives

- to state the habitat of the animal observed
- to describe the composition of the body of the species observed with the naked eye and with the help of a magnifying glass
- to specify the particularities of the sensitivity and way of move ment of the observed animal

Teaching methods

Observation, conversation, explanation

Materials

Natural material, worksheets, spade, 1 larger plastic box (for earthworms), 1 smaller plastic box (for water in which the earthworms will be washed), tweezers, magnifying glass, a sheet of paper

Forms of activity

In groups

Description of activities

In the wild garden, animals are harder to spot than plants because they hide or leave where they are, at the slightest noise made by humans. That is why, in order to make a short observation with the students, the teacher can select animals that move more slowly on the ground, such as snails, or animals that can be easily found in the ground, such as earthworms. The observation can be made with the whole group of students (12 students), which is divided into 3 to 4 subgroups, depending on the number of specimens of an existing species in the garden. The teacher will name the leader of each subgroup. The structure of the activity can be **OUT - IN** or **OUT**, if there is a place arranged in the garden where students can make the observation and complete the worksheets. Next, we will exemplify the observation of the earthworm.

Out

After the rain, when the soil is moist and the earthworms can be found at a shallower depth in the ground or even on its surface, the students accompanied by the teacher will go in the garden. They will establish 3 or 4 places, where a student from each subgroup will dig a small pit, with the help of a spade. The resulting earth will be placed next to it, and the students will look for earthworms which with a certain amount of moist soil will be put in a plastic box to be observed. The teacher will specify that the worm breathes through the skin, and it will have to be kept permanently moist. Otherwise, the animal will die by suffocation.

Out/In

Each subgroup will go to the place where they make the actual observation and complete the worksheet distributed by the teacher. The observation will be made individually, and the form will be completed by the leader of each subgroup, following the confrontation of opinions.

At the end of the observation activity, given that the earthworms contribute to loosening the soil, they will be taken to the places from which they were taken with the soil in the box.

Then, the leaders of the subgroups will present how they completed the worksheet. The teacher together with the students will establish the final conclusions.

Worksheet

Name ----------

Grade ----------

Date ----------

Solve the following tasks and write the conclusions in the table. Moisten the earthworm's body from time to time by spraying with water or placing it in the water box.

1. Where did you notice that the earthworm lives?

2. Take an earthworm from the box with moist earth with tweezers. Put it in the water box to wash it. Handle the worm gently, always using tweezers, and notice what color the body is on the dorsal and ventral side.

3. Observe the earthworm's body with a magnifying glass. What does it consist of? What does it have on the body?

4. Touch the worm's body with one finger. How is it? How is the skin? (soft / hard, dry / wet)

5. Take a worm in your hand. How does it behave? What moves does it make?

6. Take a worm with tweezers and place it on a sheet of paper. How does it move? What does it sound like when it moves?

Living environment	
Body shape	
Body color	
Body composition	
How is the skin?	
How does it behave when touched?	
How does it move?	
What does it sound like when it moves?	

The title of the teaching activity

Trills in the wild garden (long observation)

Grade level	3rd – 4th grade
Estimated time	7 months
Central idea	Knowing bird species that visit wild garden
Objectives	• to identify the species of birds observed in the wild garden • to correctly mention the popular name of each species observed • to describe the color of the plumage of the observed species
Teaching methods	Observation, conversation, explanation
Materials	Worksheets, zoological atlas
Forms of activity	Individual

In/Out

Long-term observation of bird species visiting wild garden in search of food can take place over a longer period, covering both winter and spring months, for example from November to May. Thus, students can observe sedentary birds, but also migratory ones. As birds get scared and fly at the slightest movement, they can be observed from the classroom if it has windows facing the wild garden. Also, small groups of students (2 to 4 students) can make the observation from a special place arranged in the wild garden, being accompanied by the teacher. It is up to the teacher to choose the days when the observation takes place and the duration of each action (15 to 60 minutes). Spontaneously, students can observe different species of birds, for example, when they come to school. The whole group of students (12 students) can be involved in the observation activity, each student following to complete individually and independently the worksheets distributed by the teacher. Due to the fact that students do not work at this age with keys to determine bird species, the teacher will include in the table head of the worksheets images of bird species that can be observed in the wild garden. The teacher can make several observation sheets, for each season or calendar month, for example, the sheet mentioned below. In order to correctly say the popular name of the observed species, as well as to describe the color of the plumage, students will use zoological atlases.

At the end of the period, students will present individually how they completed the observation sheet.

Worksheet

December

Name ----------

Grade ----------

Date ----------

If you have noticed a bird in the wild garden and recognize it in the pictures shown, note the date of its observation in the table below.

Using the zoological atlas, if necessary, mention the popular name and describe the color of the observed bird feathers.

Observed bird	Date of observation *	Popular name of the bird *	Color of the bird's feathers (head, body, tail, wings)
 House sparrow			
 Eurasian collared dove			

Observed bird	Date of observation *	Popular name of the bird *	Color of the bird's feathers (head, body, tail, wings)
 Goldfinch			
 Magpie			
 Great tit			

Suitable teaching methods to be used in activities with ecosystems arranged and cared for by students

2.2

2.2.2. Practical work - caring for plants in an artificial ecosystem

Brief description of the teaching method

As Iancu mentions, the method of **practical work** "is a method of learning especially practical knowledge" (Iancu, 2011).

By applying this method in formal and non-formal teaching activities, students will perform "precise work tasks, which always lead to a precise result, exactly, both in the case of applying theoretical knowledge in practice and when pursuing the formation of practical skills" (Petruţa, 2009).

Among the practical works that can be done by small schoolchildren, led by the teacher, we mention the following: the realization of some works of care of plants and animals at the corner of living nature in the classroom or in the wild garden, some works of vegetative propagation and some experiences.

The involvement of students in activities aimed at sowing, planting and caring for ornamental plants in the classroom or in a landscaped ecosystem, such as a wild garden, contributes to the development of love for nature and a sense of responsibility for the environment through their own actions. Having in mind a certain species of plant, each student will have the opportunity to observe it in different stages of development: young plant (seedling), mature plant and old plant. They will also be able to observe the influence of environmental conditions on wild garden plants, and, at certain unfavorable times, they will be able to contribute to the process of proper development (for example, by watering the plants).

Students with various disabilities, who love plants, can be successfully involved in caring for them, along with other students in the group.

The title of the teaching activity

Colors explosion in a wild garden

Grade level	Primary education
Estimated time	15- 20 minutes for each stage
Central idea	Studying how plants multiply
Objectives	• to correctly prepare the soil pots necessary for sowing / planting the plants • to sow basil and vervain in pots • to thin the basil and vervain that have sprouted in pots • to plant basil and vervain grown from seeds and cuttings correctly in pots, and then in the wild garden • water the plants, as needed
Teaching methods	Practical work, explanation, conversation, observation
Materials	Basil and vervain seeds, 2 pieces of stems with leaves from a basil (optional), 2 pieces of stems with leaves from a vervain (optional), 8 pots, 2 jars / glasses (optional), flower soil, sand, chopsticks, sprinklers, worksheets, sponge
Forms of activity	Individual

Description of activities

Obtaining new plants to beautify the classroom and the wild garden can be done from seeds (eg. basil, vervain, thymus, rosemary, salvia. etc.), from bulbs (eg. daffodil, chives, etc.), stolons (eg. clover), or from other parts of the body of a plant (eg. , from stem portions with basil leaves, from stem portions with vervain leaves). In the activity to be carried out with the students (8 students) only two species of plants will be considered: the basil (4 students) and the vervain (4 students). If, for plant multiplication, only seeds will be used then all students will do the same type of practical work. If there is the possibility of multiplying the plants through cuttings, then 2 students will consider the vegetative multiplication of the basil, and other 2 students, that of the vervain. The other 4 students will sow the two species of plants. The possibility of propagating plants by bulbs will be presented in subchapter 2.2.5. The structure of the activity will be: **IN/ IN/OUT**.

In

In the first stage, students will prepare pots for plants. They will mix the soil with a certain amount of sand. The mixture will be placed in pots, but without filling them. Next, the first pair of students will sow a few seeds (basil and vervain) in each pot. On top of them, they will put a thin layer of soil, which they will water with a sufficient amount of water, with the help of a sprinkler. In the days to come, these students will water the soil less often, if necessary. The other students will tear two pieces of leafy stems from the basil and the vervain. They will remove the leaves from the bottom of the stem piece and put the vegetative organ in a jar / glass of water, so that the remaining 3-4 leaves at the top will remain on its edge. Then, they will fill with water whenever necessary. Containers with both species of plants will be placed in the classroom in a well-lit and heated place.

In

In the second stage, the students in charge with growing the new plant from seeds, le will thin them out, while the students who have rooted the vegetative organs of the basil and the vervain - if those have taken root, will plant them in pots. Both practical works will be demonstrated initially by the teacher, in front of the whole group of students, and then they will be individualized by the students. Before thinning the plants, approximately one month after sowing, the soil of the pots will be well watered so that one can easily remove the excess plants. If possible, excess specimens will be removed with a little soil, so that they can be donated and replanted by other students in pots or in their own garden. In the classroom, only two pots with replanted basil and vervain will be kept, in order to be able to observe their growth and development, compared to those grown from seeds. The four students who sowed basil and vervain will leave 1 specimen in pots so that they have enough development.

Students with rooted basil and vervain plants will receive a worksheet outlining the following steps for planting them:

1. In the middle of the pot, press with a stick to make a small hole.
2. Fix the roots of the plant in the small pit created.
3. Cover the roots of the plant with soil and lightly press the soil.
4. Add the rest of the soil around the plant so that it is fixed straight in the pot.
5. Fill the pot with soil, lightly press the soil, and then water the plant with a sprinkler.
6. Place the pot on the window.
7. Clean the place where you did this practical work

Out

In the third stage, when it is getting warmer outside, the students will plant basil and vervain from cuttings in the wild garden, making a circle of flowers. To make it easier to catch, the plants will be removed from the soil with pots, and then they will be planted in the holes made with the help of the spade in the garden. Steps 4 and 5 will be followed, as in the case of planting a potted plant. Next, students will water the plants when necessary, dig around them, under the guidance and supervision of the teacher, to allow water and air to enter the soil, and uproot herbs from the rounds created, to support the growth of small plants. Students will thus be able to observe the life cycle of these two plants, and the multitude of colors that will be in the wild garden when the plants bloom, will reward their entire work.

In the classroom, 4 pots with basil and vervain will be kept, to perform various experiments.

2.2.3. Experimenting the world of plants in the ecosystem

Brief description of the teaching method

The **experiment** is the didactic method by which students are put in the situation to intentionally cause a biological process or phenomenon, or to modify the normal conditions of their development by introducing new variables, in order to study them, in order to observe how they are carried out, to perform research of causal relations, and to rediscover and check the laws and some hypotheses that govern them a (Petruța 2009).

As mentioned by many teachers (Iordache et. Colab, 2004; Petruța, 2009; Iancu, 2011, etc.), this method should not be confused with practical work, which is used mainly for students to acquire practical knowledge. Compared to the previously mentioned method, the experiment is a research method, through which students are stimulated to formulate and verify hypotheses, to process and interpret data, to draw pros and cons, to draw conclusions, and the result obtained by students may vary.

There are many forms of laboratory experiments, classified according to different criteria. Of these, for primary education we mention the experiments:

- short or long-term experiments - which can be done in the living corner arranged in the classroom, in the wild garden or in nature
- demonstrations, made by the teacher
- research, conducted by students
- experiments carried out frontally, in groups or individually

Young schoolchildren can perform experiments on the influence of certain environmental factors, such as humidity, heat and light on seed germination and on plant growth and development.

In the case of simple experiments, students with different disabilities may be involved, depending on their desire to participate in such activities.

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The title of the teaching activity

Collection of dried herbaceous leaves

Grade level	Primary education
Estimated time	15 to 20 minutes
Central idea	Knowing how making an herbarium
Objectives	• Correctly collect leaves of different grassy and woody plants from the wild garden • Properly press harvested leaves • Determine the species of plants whose leaves have been pressed • Make the herbarium correctly
Teaching methods	Practical work, explanation, conversation, observation
Materials	Leaves, white grass sheets, blotting sheets, thin A4 cut cardboard, cutter/ scissors, narrow scotch, old notebook/old book, weights (2 or 3 books, notebooks, etc.), colored pencils, pictures of plants from which the leaves were harvested, labels, botanical atlas
Forms of activity	Individually
Descrizione delle attività	The wild garden may contain more or less species of grassy and/or woody plants, which can be studied by students. Following the observation activity, in order to fix the knowledge of the students, the teacher can choose to make herbaceous “tables”, containing leaves of the plants analysed. The students, under the careful supervision of the teacher, will harvest the vegetative organs, which they will later press and stick on a thin cardboard.

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Since in primary education for the identification of plant species we have not worked with the keys of determination, each herbaceous edge will contain a leaf with next to the design or image of the plant to which it belongs. The teacher will decide the number of plant species whose leaves will be included in the herbarium. If the number of species in the wild garden is low, then students can collect leaves from the same plant species. A group of 12 students can participate in the activity, in which students with special needs can be integrated. The structure of the activity will be OUT / IN.

Important: Not all existing leaves will be collected from the stem of an herbaceous plant, as it will affect the plant's life. In order not to destroy plant species in the wild garden, it is advisable to make a limited number of herbariums at school.

Out

On a sunny day, students under the guidance of the teacher, will harvest leaves, taking care not to damage them, that they do not present parasites and contain all the components - sheath (where appropriate), petiole and limb. To remove the leaf from the stem, if necessary, they will use the cutter/scissors.

In

Each student will place the harvested leaf between two sheets of blotch. These will be placed in an old notebook or in an old book, on which the weights will be placed. Then, each student will draw the plant to which the leaves belong or will put its image on the right side of the cardboard sheet. After 2 or 3 days, they will check the condition of the pressed leaves and change the sucker, if it has become wet. After about a week, the leaf will be fixed with the tape on the cardboard sheet, on the left side. A piece of tape will be placed over the petiole and another under the tip of the limb. Under the vegetative organ, each student will complete a label, writing the popular name of the species, the place and date of collection. For the correct identification of the plant, students will use the botanical atlas. The boards made by the students will be placed on white sheets and will be components of the classroom herbarium.

The title of the teaching activity

Why plants don't bloom?

Grade level	Primary education
Estimated time	One week
Central idea	Recognize the influence of light on plants
Objectives	• to place the pots with plants in the wild garden, in places with different degrees of brightness • write down what happens to potted plants • draw conclusions about the role of light in plants' life
Teaching methods	Experiment, observation, conversation, explanation
Materials	4 pots with plates for basil and vervain, sprinklers, worksheets
Forms of activity	Individual
Description of activities	Highlighting the importance of light for the development of a plant can be achieved by conducting an experiment in which the same plant species are placed in places with different brightness in the wild garden. The activity can be attended by a group of 8 students, who will use for experimentation the plants obtained from the practical work of propagation of basil and vervain seeds. The structure of the activity will be **OUT/IN** or **OUT**. The experiment can be performed in April, 3-4 days after the practical work is completed.

Out

The students, under the guidance of the teacher, will move in the wild garden, in order to identify 4 places with different degrees of brightness. Thus, they will find a place strongly illuminated by the sun, a place less lit, for example, under a bush, a place even less illuminated, for example, under a tree and a place without sunlight, for example in a warehouse / box located in the wild garden.

In each area, students will bring a pot of basil and vervain. The teacher will distribute a worksheet to the students, in which each one will have to write down individually what happens to the plant organs (stem, leaves, flowers) during a week. He will specify that the plants will be watered as needed, in 1-2 days or not at all, if it rains outside during the experiment.

Students will complete worksheet part A.

In

After one week, each student will read the data mentioned in the worksheet. Under the guidance of the teacher, the results obtained in the experiment will be analyzed, respectively the hierarchy of places where plants have developed normally and flowered will be established. Both the same species and both plant species will be considered. At the end, the conclusions regarding the influence of light on the development of the species subjected to the experiment will be established.

N.B.: iven that students will participate with the plants obtained by themselves in the practical work done previously, and during the experiment will notice that the plants of some colleagues will bloom and their own plants will not bloom, or even will regress in terms of development, at their request, the potted plants will be relocated to a lighted place, so that the plants recover and grow normally.

A similar experiment can be performed, given the influence of humidity on the growth and development of both plant species. The 6 pots with saucers and 2 without saucers, in which basil and vervain were planted, will be placed in the same place in the wild garden, but will be watered differently. The first 2 pots with saucers in which they were planted with basil and vervain, the plants will be excessively watered. In the next two pots with saucers, the plants will be watered as needed, and in the last two pots, the plants will not be watered at all. Plants in pots without saucers will be excessively watered.

Students will complete worksheet part B.

The data mentioned by the students in the worksheets are analyzed similarly to the experiment mentioned above, finally establishing the conclusions.

N.B.: after 2-3 days, students will notice that the plants in the pots with saucer, excessively watered, will begin to wither, while the specimens placed in pots without saucers will develop normally and bloom. The teacher will explain to the students that if the experiment continues, the plants in the two pots will die. At the request of the students, the saucers of the two pots will be removed, as well as the excess water, so that the plants recover, grow normally and bloom. This must be done before long-term wilting is installed, in which case the plants will not recover.

Worksheet *

Name and surname ----------

Class ----------

Part A

Pots with ----------

Location of the plant	
Date/Observations	
Date/Observations	
Date/Observations	
Date/Observations	
Date/Observations	
Date/Observations	

Parte B

Pots with ----------

How to water the plant (excessive/normal/not at all)	
Date/Observations	
Date/Observations	
Date/Observations	
Date/Observations	
Date/Observations	
Date/Observations	

* work tasks are also carried out by students with different disabilities.

2.2.4. The problem-solving method

Brief description of the teaching method

The problem-solving method is a heuristic one, which involves the creation of problem situations by the teacher.

The problem situation is conflictual, surprising for the student, because it results from the simultaneous experience of two realities: the past experience (the knowledge previously acquired by the students) and the element of novelty, the unknown they face with. This contradictory situation causes students confusion, amazement, uncertainty, inner conflict, curiosity, stimulating them to seek solutions (Cerghit, 1983). It must "be real, so as to arouse the curiosity, interest, desire of students to research, to discover solutions to solve the perceived problem."

In the case of formal activities, the solution of the problem situation by the students is made in the same stage of the lesson in which it was stated by the teacher, with the help of the landmarks offered by the teacher or by updating some previously acquired knowledge. by students.

However, in the case of a non-formal activity, which involves carrying out a practical work to solve the problem situation, it will be solved after a few days, as can be seen in the example below.

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The title of the teaching activity

Is the bulb of a plant a root, stem, fruit or seed?

Grade level	Primary education
Estimated time	3-5 days
Central idea	Acknowledge the role of the bulb in the life of a flowering plant
Objectives	• to place the plant bulbs correctly in the water jars • to note what happens to the plant bulbs in a certain period of time • to draw conclusions regarding the bulb, as an organ of a flowering plant
Teaching methods	Problem-solving method, practical work, observation, conversation, explanation
Materials	2 bulbs of each plant: tulip, daffodil, hyacinth and onion, 8 small jars, worksheets, scalpel
Forms of activity	Individual
Description of activities	The activity can be attended by a group of 8 students. The activity structure will be **IN/OUT** or only **IN.**

In

In class, the teacher will mention that certain plants, such as snowdrops, cranberries, daffodils, tulips and hyacinths are propagated by bulbs. In the selection of the species, it is always recommended to choose the native ones, with special attention to those mentioned in the "Educational proposals". If it's useful to use cultivated species for the observations to be carried out, it is recommended to proceed with the planting in pots.

Students will ask: what is a bulb, a root, a stem, a fruit or a seed? He will analyze the role of each mentioned organ, and in order to solve the problem situation, he will distribute to each student bulbs with onion, daffodil, tulip and hyacinth roots, so that everyone has a bulb.

The teacher will distribute the worksheet, which the students will complete independently. Each student will place the received bulb on top of a jar of water so that only the root area reaches the water.

After the period in which the bulb of the plant was observed, a specimen of the bulb of each species will be sectioned with a scalpel in two parts. Students will notice the appearance of a new plant.

At the end of the activity, the teacher, together with the students will establish the conclusion according to which the bulb is an underground stem, because it has a bud at the top, which will give birth to a new plant.

Out/In

Bulbs that have not been sectioned will be planted in pots.

Worksheet *

Name and surname ----------

Class ----------

Place the bulb on top of a jar of water so that only the root area reaches the water. Write every day what changes occur in the observed bulb.

The initial appearance of the bulb of the plant	
Date/Observations	
Date/Observations	
Date/Observations	
Date/Observations	
Date/Observations	

* work tasks are also carried out by students with different disabilities.

Suitable teaching methods to be used in activities with ecosystems arranged and cared for by students

2.2

2.2.5. Dialogues in an open-air teaching setting

Brief description of the teaching method

Conversation is considered one of the most active and effective methods used in the study of natural sciences. "It consists of a dialogue between teacher and students (didactic dialogue) based on a series of questions and answers formulated according to the knowledge previously acquired by students" (Petruța, 2009).

In both classroom and outdoor activities, the teacher must comply with certain requirements for formulating and using questions, such as the following: to be formulated correctly from a scientific and grammatical point of view; to be addressed to all students; to be precise; not to ask for monosyllabic answers; to require the operations of thought, creative imagination; to allow spontaneity and initiative of students etc.

In the case of outdoor activities, for example, in the wild garden, it would be advisable for the students to be seated in a semicircle, around the teacher, so that everyone is attentive and hears the questions asked. She/he can ask the following types of questions:

- ✓ Reproductive - which requires especially memory, for example: What is the role of the root of a flowering plant?
- ✓ Reproductive-cognitive - which requires memory, for example: What are the similarities and differences between chives and daffodil?
- ✓ Productive-cognitive - which requires productive thinking, for example: Why do snails need calcium?
- ✓ Anticipatory - which requires intelligence, for example: What would happen if bees disappeared from Earth?
- ✓ Assessment - which requires logical thinking and intelligence, for example: What is your point of view on the role of earthworms in the wild garden?
- ✓ Discovery - which requires logical thinking and intelligence, for example: How do you explain the fact that the primrose rises and blooms in early spring?

Heuristic conversation is one of the forms of conversation through which students are helped to recall their previously acquired knowledge, to reflect and make connections so as to discover new knowledge, for example: the characteristic features of a group of living things, the relationships between structure and function; to draw conclusions.

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The title of the teaching activity

Grassy and woody plants in the wild garden

Grade level	Primary education
Estimated time	15 minutes
Central idea	Knowing the difference between a herbaceous and a woody plant
Objectives	• to characterize the component parts of a herbaceous and a woody plant • to identify other grassy and woody plants in the wild garden • to formulate conclusions regarding the types of plants analyzed • to establish the similarities and differences between the two types of plants
Teaching methods	Conversation, observation, explanation
Materials	Living biological material (herbaceous and woody plants from wild garden)
Forms of activity	Frontal
Description of activities	The activity will take place in the wild garden, with the whole class or with a certain group of students. Students with various disabilities, even those with visual impairments, can also be involved, they can provide answers to questions using other senses (e.g. touch). When the teacher wants to apply the conversation in a formal or non-formal activity, he will choose any species of grassy and woody plant existing in the wild garden.

Out

The teacher will ask the following set of questions about a herbaceous plant: which are its components that can be seen above the ground? What color is the stem? Touch the daffodil stem! How is it? What about its surface? Regarding the thickness, what can be said about the stem? What happens to the stem if the wind blows? How long do you think the stem of this plant survives? What color are the leaves? How are they placed on the stem? What color is the flower? Where is it? Who fixes the plant in the soil? What does the root continue with? Given the fact that the root and the underground stem cannot be observed, they will not be analyzed in detail, but only mentioned as component parts of the plant.

Then, another herbaceous plant will be analyzed, asking the same questions. Next, the teacher will ask students to mention the similarities and differences between the two species of plants. The teacher will ask students to identify in the wild garden other plants that have the same type of stem. At the end of the dialogue, the teacher will mention that all plants that have the characteristics of the above-mentioned stem are called herbaceous.

Next, we will analyze the composition of a shrub tree, for example the hawthorn, applying a set of questions similar to the one used for herbaceous plants. The teacher will adapt the content of the questions, knowing that the stem consists of trunk and branches. She/he will not insist on the characterization of plant organs that cannot be directly observed.

After analyzing and comparing the parts of the hawthorn with another shrub (e.g. lilac) identified in the wild garden, students will find that their stem is brown, more or less thick depending on the age of the plant, hard, smooth or rough, also depending on the age of the plant and it does not dry out after a certain period of vegetation. It will be mentioned that the shrub has a lower height than the tree and it has a bush-shaped root.

Later, students will identify trees and other shrubs in the wild garden. At the end of the conversation, the teacher will specify that all plants that have the characteristics of the above stem are called woody.
At the end of the activity, students will establish similarities and differences between the two grassy and woody types of plants.

N.B.: the mentioned heuristic conversation can also be applied in the activity **Perfume of spring / summer / autumn in the wild garden - Observation of several flowering plants**, if the students encounter difficulties in identifying the types of plants.

2.2.6. Demonstrating the living organisms in the ecosystem

Brief description of the teaching method

Demonstration of organisms in their living environment is a form of demonstration that "makes it possible for students to discover specific features of these organisms, as well as to be aware of their adaptation to the living environment" (Ciolac-Russu, 1983).

In a wild garden, the external composition of different plant species, certain invertebrate animal species (e.g., earthworm, snail, spider etc.) and vertebrate (e.g., toad, hedgehog etc.) can be demonstrated.

"For the formation of concepts in the first years of school, demonstration can be correlated with observation and explanation, but given the need to stimulate the thinking of young schoolchildren, it is recommended that the teacher correlate the demonstration with the conversation, so that students understand different relationships as the relationship between the organism and the environment, between the structure of the different organs and the function they fulfill, etc." (Petruța, 2014).

Demonstration of living organisms in a natural or artificial ecosystem can be done by the teacher, but also by students, who thus become active participants.

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The title of the teaching activity

The component parts of a grassy and woody plant in the wild garden

Grade level

Primary education

Estimated time

15 minutes

Central idea

Studying a grassy and woody plant

Objectives

- to demonstrate the component parts of a grassy and woody plant
- to describe the vegetative and / or multiplication organs of the demonstrated plants
- to mention the role of the vegetative and/or multiplication organs of the two types of plants

Teaching methods

Demonstration, observation, conversation, explanation

Materials

Living biological material (grassy and woody plants from wild garden)

Forms of activity

Frontal

Description of activities

The application of the demonstration of organisms in their living environment can be done in a formal activity, in the stage of fixing the knowledge regarding the component parts of grassy and woody plants, as well as their role. The activity will take place in the wild garden, with the whole class. It is up to the teacher to choose the species of grassy and woody plants.

Out

After transmitting the new knowledge, regarding the component parts of a flowering plant and their role, the students accompanied by the teacher will go to the wild garden, in order to identify a flowering herbaceous plant. In turn, each student will be asked by the teacher to indicate with the indicator a certain component part of the plant (for example, the leaf), and other students will mention the function (s) it performs. It would be advisable for the order of mentioning the component parts of the plants to be demonstrated by the students to be different from what can be identified by observation above the ground. For example, the first organ that will be demonstrated by the students will be the flower, then the stem and finally the leaf.

The same will be done for a woody species, tree or shrub. Depending on the time available and how the students will perform their tasks, 1 to 3 species of grassy and woody plants will be considered.

During the activity, the teacher will involve as many students as possible, either to perform the demonstration of the bodies, or to answer the questions asked.

Suitable teaching methods to be used in activities with ecosystems arranged and cared for by students

2.2

The investigation is a "research, thorough study, carried out systematically, in order to discover something". https://dexonline.ro/definitie/investigația

As Oprea mentions, it can be used as a way of learning, but also as a way of assessment. In both cases, it "offers the student the opportunity to creatively apply the acquired knowledge in new and varied situations over a longer or shorter period" (Oprea, 2009).

In educational practice, this method "consists in requesting to solve a theoretical problem or to perform a practical activity for which the student is required to undertake an investigation (documentation, observation of phenomena, experimentation etc.) over a set period of time." (Radu, 2000).

As Ciascai states, the starting point in an investigation is an "open question regarding the explanation of a phenomenon or situation-problem that generates a cognitive conflict" (Ciascai, 2016).

In order to carry out an investigation correctly, students will first have to define and understand the problem to be investigated. Then they will issue hypotheses, which during the action taken will be or will not be confirmed, will argue the hypothesis / hypotheses formulated, will choose the methods they will use in the investigation, will collect and organize the data obtained, and at the end will establish the conclusions, preparing a short final report on the obtained results.

Iancu Ciobanu appreciates that "in order to be an investigation, several experimental, individual or team activities must be designed and carried out" (Iancu Ciobanu, 2009).

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The title of the teaching activity

Why do only some flowering plants grow and develop normally?

Grade level	Primary education
Estimated time	3 to 4 weeks
Central idea	Studying the influence of environmental factors (soil, water, light) on the growth and development of a flowering plant
Objectives	• to identify environmental factors that may influence the growth and development of a flowering plant • to formulate hypotheses regarding the influence of some environmental factors (soil, water, light) on the growth and development of a plant • to specify the way in which the formulated hypotheses can be verified in a practical way • to collect data correctly during the investigation carried out • to draw the final conclusions, following the processing of the data obtained in the investigation
Teaching methods	Investigation, experiment, observation, conversation
Materials	Living biological material (12 thyme seeds), 12 medium pots with holes for draining water and plates, 4 sheets of dark paper, magnifying glass, scotch tape, roulette, sprinklers
Forms of activity	Individual

Description of activities

The application of the investigation can be done after the students have studied the environmental conditions necessary for the growth and development of plants or living environments. Given that several experiments are performed during the investigation, the activity will take place in the classroom, involving the whole group of students (12 students), even small schoolchildren with various disabilities, but who show interest and desire to participate. The teacher will choose the species of herbaceous plant that will be used in the investigation (e.g., geranium, beans, peas etc.).

In

In class, the teacher will present the following problem situation:

At maturity, a flowering plant produces seeds, which will reach different living environments, being spread by the wind. Some seeds, finding good living conditions, germinate, giving birth to new plants. Why will only some of these plants grow and develop normally?

The teacher will ask students to formulate hypotheses about the causes that could cause the abnormal development of plants or even their fading and death. Students will make different hypotheses, such as the following:

A If the soil does not meet the requirements of the plant, then it will be small in size

B If the soil does not retain water according to the needs of the plant, then it will fade

C If the soil retains too much water, then the plant will fade

D If the plant does not have enough water, then it will fade

E If the plant does not have enough light, then its leaves will not be able to perform photosynthesis, and the plant will not have enough food to grow and flower

F If the plant does not have enough light, then its leaves will turn yellow and the plant will fade

Then, the teacher will ask the students to argue their hypotheses and to propose ways to verify them in practice. Among the answers that students will be able to formulate, we mention the following:

- in order to highlight the importance of the soil for the growth and development of a plant, it will be possible to use different types of soil in which the plants will be sown/planted
- in order to emphasize the importance of water in the life of plants, they will be watered with different amounts of water
- in order to highlight the importance of water in the life of plants, they will be watered with the same amount of water, but at different time intervals
- to emphasize the importance of light, some plants will be placed in sunlight, and others will be wrapped in dark paper or placed in dark places etc

The teacher will mention that three experiments are to be performed, in which only one environmental factor will vary, using the same plant - thyme. Initially, the teacher will ask all students to observe with the help of a magnifying glass the beans made available and each to choose a single "healthy" seed. He will form three groups, each to perform an experiment. Each group will consist of four students who will work individually under the guidance of the teacher.

The first group will perform an experiment that tests the hypotheses regarding the importance of the substratum for plant growth and development. The first student in the group will put soil in the pot, the second, soil mixed with sand, the third, sand, and the fourth, substratum for orchids. Each student will sow the chosen seed and water the substratum with water. The four pots will be placed at the window, and the substratum will be watered and loosened whenever necessary. This will provide all plants with light, heat, water and air.

The second group will perform an experiment to test the assumptions about the importance of water for plant growth and development. All four students will put soil mixed with sand in pots, sow the chosen seeds and place the pots at the window. The substratum will be loosened whenever necessary, but will be watered differently with the same amount of water. The first plant will be watered every day, the second plant once every two days, the third plant once every three days and the fourth plant once every four days. The plants will grow in the same conditions of soil, light, heat and air.

The third experiment, which tests the hypotheses regarding the importance of light for plant growth and development, will be performed by the third group. All students will sow the seeds in pots filled with the same substratum - soil mixed with sand. They will limit the amount of light that will reach the plants by wrapping the pots in dark paper. In the case of the first plant, the paper will have a height of 10 cm above the pot. As for the second plant, it will be wrapped so that the paper is 20 cm above the pot. The third plant will have a higher screen, the paper being placed in such a way as to exceed the edge of the pot by 30 cm. In the case of the first three plants, the top of the paper will remain free, being the only place through which light will enter the plants. Regarding the last plant, it will be completely wrapped in dark paper. This will exceed the edge of the pot by 30 cm, and the top of the screen will also be covered with paper, so that the light does not reach the plant. For all plants, the paper screen will be stuck with strips of scotch tape to the pot so that it can be easily removed when the plants are watered and the soil is loosened. The plants will grow and develop in the same conditions of soil, water, heat (classroom temperature) and air.

During the experiments, each student will fill in an observation sheet, where she/he mentions general and particular aspects of the observed plant. Photographs will also be taken of the evolution of the plants in the different environmental conditions created during the investigation. Observations and measurements will be made every 2 to 3 days. After 3 to 4 weeks, each student will read the content of the observation sheet. At the end, the students guided by the teacher will establish the conclusions for each experiment and for the investigation performed. It will be highlighted that each environmental factor (soil, water, light) is necessary within certain limits for the normal growth and development of a flowering plant. Insufficiency of a single environmental factor or exceeding a certain limit in case of an environmental condition has negative repercussions on the plant.

N.B.: after several days of observation, some students will find that the plants they care for in the experiments are affected by some environmental factors and begin to fade. The teacher will explain to the students what the evolution of the plant is, if the variation of an environmental factor continues in a negative way within the experiment. At the request of the students, favorable conditions for growth and development will be created for the affected plants, so that each student has the satisfaction of saving his own plant from fading or even death.

Observation sheet *

Name and surname ----------

Class ----------

The popular name of the plant observed in the investigation ----------

Date of plant springing	
Date/General appearance of the plant	
Date/Plant height	
Date/Appearance of each leaf	
Date/Color of the leaves	
Date/Appearance of each flower	
Date/Fading of the plant	

* work tasks are also solved by students with different disabilities.

Suitable teaching methods to be used in activities with ecosystems arranged and cared for by students

2.2

2.2.8. Search-Think-Build

Brief description of the teaching method

To summarize the students' knowledge regarding the plants and animals of the wild garden, as part of some formal or non-formal activities, the interactive teaching strategy entitled Search-Think-Build (Petruța, 2017) can be applied.

Applying different teaching methods, combined with the use of a variety of teaching materials and forms of organization of the activity of multiple students (individually, in groups and frontally), this strategy offers each student the opportunity to present their knowledge on the topics addressed, to correct them or to enrich and arrange them.

The title of the teaching activity

Plants from the wild garden

Grade level	Primary education
Estimated time	30 minutes
Central idea	Strengthen knowledge about plants in the wild garden
Objectives	• Identify the image of the plant species corresponding to its name • Select sentences indicating characteristics of the summarized plant • Ask questions concerning the particularities of the plant in question • Make correctly the graphic organizer corresponding to the analysed plant
Teaching methods	Graphic organizer, conversation, explanation and demonstration
Materials	Bowl, notes with sentences about recapitulated plants, 4 sheets of paper, images of plant species from the wild garden, colored pencils
Forms of activity	Individually, in groups, frontally

Description of activities

During the activities in which they participated in the wild garden, the students acquired some knowledge about the plant or animal species considered. Finally, when the activities proposed to the students have ended, or during the winter, the teacher can pay attention to the organization of the students' knowledge and will decide whether to summarize plant or animal knowledge. The activity can take place in the classroom with the whole group of students or with a smaller group (12 students). The class/group of students will be divided into a number of groups/subgroups according to how many species will be summarized with the students. The number of students in groups/subgroups will vary, depending on the total number of students involved in the activity. Finally, we will explain how to apply the Search-Think-Build strategy in order to recap students' knowledge of four species of plants (mint, lavender, forget-me-nots and elderberry), during an activity with 12 pupils.

In

The teacher will form four subgroups with three students each. The groups will choose a representative student who will draw from a bowl a note with the name of a plant species (for example mint), an envelope with pictures of the plant species existing in the wild garden and 15 sentences related to the 4 considered plant species.

Initially, the teacher will write the 15 sentences on the computer and will list the text as many times as there are groups of students. Then he will cut out each sentence, mix them and put them in an envelope. This will be done 4 times, getting 4 envelopes with 15 sentences.

The sentences can be the following:

- It is an herbaceous perennial plant that spreads spontaneously on meadows, along the waters and in mountain meadows
- It has a height from 20 to 40 cm
- It is a shrub that can rarely grow like a tree
- It forms short bushes
- The fruits are black-purple when ripe
- The flowers are blue with a yellow centre, but can vary depending on the species, from pink to white
- It is an evergreen shrub that adapts well to different types of soil
- The flowers are arranged in inflorescences and are white and pink
- It has a height from 20 to 60, up to 100cm
- The flowers are small, white, grouped in umbrella-shaped inflorescences
- It has a height from 30 to 100 cm
- It is a perennial herbaceous plant whose leaves have glands that produce essential oils that give it its characteristic aroma
- It produces inflorescences at the top of the stem, each of which contains a variable number of lilac blue flowers with an intense scent
- It has a height varying between 2 and 8 m
- The leaves are whole, linear

The representative student of each group will ask each member to extract 5 sentences. Students read the statements individually and decide which one refers to the plant species in question. For example, the students in group 1 will think and establish the sentences that refer to mint.

Later, each group will have to build a descriptive-interrogative graphic model, which will contain the image of the plant whose name was mentioned on the drawn ticket and various sentences. The representative will stick the image of the plant in the centre of the sheet of paper, and below it will write its popular name. Then, each member of the group will read, in turn, the selected sentences. These will be analysed by the rest of the students in the group. If they think the sentences are correct, the group representative will stick them on the piece of paper. Subsequently, each member of the group will draw lines to the sentences personally identified. Thus, each group will build a graphic model about the considered plant species.

Then, students will think of questions that can be asked, starting from the existing sentences in the graphic model, such as: Why? As the group is divided into four subgroups, each subgroup will have to ask three questions for the remaining subgroups. For example, members of subgroup 1 will ask questions for subgroups 2, 3, and 4. Questions such as: Why is lavender an aromatic plant? Why do mint leaves have a characteristic smell? Why forget-me-nots are perennial? Why is elderberry a shrub?

Finally, the representative student of each group will present the graphic model. He will address the questions asked for the other groups, and finally the winning group will be established.

Educational resources in the "open air teaching" process

2.3

The finality of the "open air teaching" process is the direct changes produced at the level of students' behavior. The student learns in a practical, active way, through personal experiences, reflects on his own experiences, understands the concepts and thus develops his own experience of knowledge.

Reflection

Duration: 10 minutes

Reflect on the following general principles in education

! The right to be different or the right to diversity is a fundamental human right.

! In the learning activity, there are significant differences in rhythm, volume, profoundness and style between children.

What recommendations would you make to teachers so that these premises can be rendered into effective educational practices?

The goal of the educational process is the placement in everyday life of the elements that children learn at school, the development of practical spirit and adaptation to concrete life situations, ways of understanding the educational elements taught in class.

The educational environment is outside the classroom, being supported by interactive methods, less conventional and aimed at developing the well-being of the student; learning is experimental and is learned in authentic environments.

Starting from Kolb's experiential learning model, one can analyze the "open air teaching" process from the perspective of the 4-stage cycle (Kolb, David A. Experiential learning: experience as a source of learning and development. Pearson Education, 2015): experience / exploration, observation / reflection, abstract conceptualization, active experimentation.

Starting from a concrete experience, the student questions the situation ("What happened?", "What are the results?") and issues his own opinions, theories ("What do these results mean?", "What influences the result?", "How did I influence the results? "); after building the appropriate ideas and solutions, learning is achieved through a practical experience that will generate improved future actions, and a new experience will be developed, generating reflection.

The most common experiences developed on this model are outdoor learning activities (to do some experiments on their own, measuring distance in math classes, for example); role-plays and simulations of real-life situations, presentations and projects based on the analysis of experiments, films, shows or theater performances; carrying out outdoor projects, organizing thematic trips and practical applications for any subject.

The "open air teaching" process is based on children's direct experience with nature, with the environment, encouraging their growth and education in a healthy environment and providing the opportunity to stimulate curiosity and natural learning.

The educational environment is personalized to each field of training, such as education for nature and man, ecological education, science education, as well as various activities - personal development, training of life skills, practical skills, relaxation, walking, hiking and adventure and so on.

The natural educational environment involves direct contact with nature, it is a relaxing, free environment that can offer students countless challenges, it is an organized form of education that prepares children for their future life in the natural environment.

The teacher's roles are redefined in the direction of securing the student's training path according to individual opinions, interests and needs. In the "open air teaching" process we identify the following alternatives (http://www.docs.hss.ed.ac.uk/education/outdoored/oe_authentic_learning.pdf):

- no role for the teacher, the student's development will occur according to his interest in learning
- the teacher as "frosted glass", being the one who selects and provides the information
- the teacher as a "filter", the student's learning experience is mediated according to what the student needs
- the teacher and the student share a common experience

The educational environment is built according to the principles of constructivism, "the student is a constructor who builds ideas, projects, means, solutions, products-artifacts, own mental structures" (Joiţa, 2006, p. 39). "Knowledge that is situationally constructed has long-lasting effects and is active" (Siebert, 2001).

Brainstorming

The storm of ideas will be realized around the theme "Organizing the educational environment in open air teaching process"

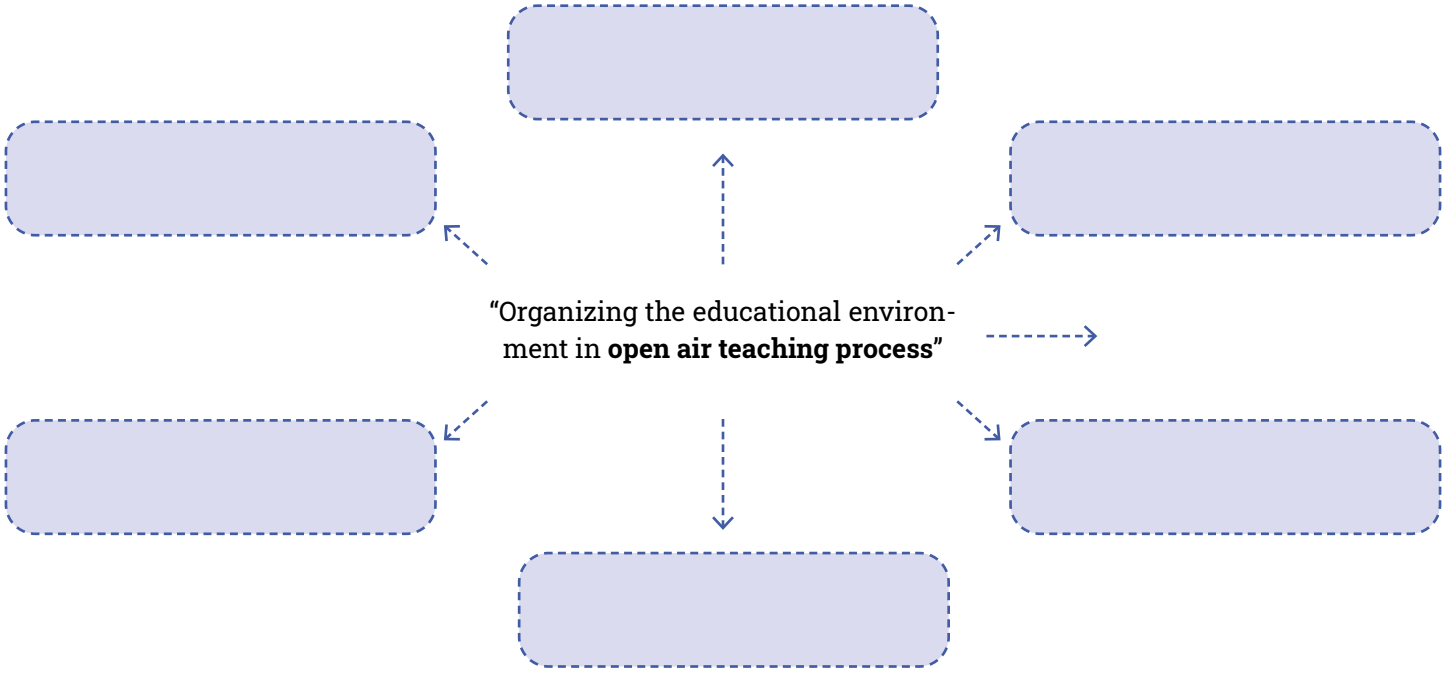
Working time: 10 minutes

Instructions for the trainer:

A the topic of analysis is launched and each participant is presented with an argument

B all the proposed ideas will be noted on the map

C the ideas are analyzed and only the reasoned statements will be kept



The design of an "Open air teaching" process involves the diversification of support materials, educational means (diversification and modernization of educational means induces the need to combine traditional strategies with technological ones); on the other hand, it is supported by the realization of transformations, interpretations, constructions and reconstructions; it is necessary to combine strategies based on reception / traditional with those of search, discovery, action based, problem solving. *Learning becomes authentic*, "it promotes and supports the active construction of meaning for students. (...) an approach of discovery and construction of their own knowledge, of their own cognitive structures" (Ciolan, 2008, pp. 134).

Learning environments (settings, i.e. the way of arranging the learning space) and learning cultures (the atmosphere built by those participating in the process, through communication style, social aesthetics, forms of politeness used) become activating and stimulating. (Siebert, 2001).

Such a learning environment is favored by expeditionary/adventure learning - it uses non-formal learning experiences that challenge students, most often in natural contexts; emphasis is placed on creating relevant learning contexts and experiences, on direct contact with the social, cultural and natural environment.

The educational means specific to expeditionary/adventure learning are educational means such as live animals, collections of plants, rocks, material, insects, seeds or their substitutes (photographs, scientific films), used in educational activities of observation, experiments, viewing of shows with animals, plants, game-based activities, reading texts with specific content. Their use in the educational approach will ensure the development

of naturalistic intelligence. Children who are connected with nature, talk to flowers and tend to collect leaves, stones, photos. They go to the park with pleasure, admire nature, are interested in plants, documentaries about plants and animals.

Application

Level	4th grade (9-10 y.o.)
Topic	"Children protect the environment"
Objective	The development of naturalistic intelligence
Prerequisites	General knowledge about living environments, human-nature relationship, pollution, sources of pollution, spatial orientation skills
Key questions:	1. How can we protect the environment? 2. What is the human-nature connection?
Learning task	Suggest educational resources that can be integrated into the educational process of developing students' naturalistic intelligence and argue their formative value

Natural educational resources ----------

Argument ----------

ICT educational resources ----------

Argument ----------

Educational resources for project-based learning

Argument ----------

Application

Working time 10 minutes

Instructions for the trainer

A The trainer will present a diagram of the educational resources from the "open air teaching" process

B Students propose examples of educational resources and will analyze their formative value

Application - FLOW diagram

It is a useful technique for identifying the essential elements of a material (after Joița, 2008).

Communication of the work task

Participants will identify educational resources that will be integrated into the "open air teaching" process.

Group activity

The members of each group work together to complete the diagram.

Frontal activity

One representative from each group presents the formative value of the educational resources used in the "open air teaching" process.

Another approach to the "open air teaching" process can be the organization of activity centers / stimulation areas / outdoor development areas. These areas can be delimited as a quiet area, an area of physical activity, manipulation / mathematics game, construction game, role play and art, ensuring the educational resources corresponding to the area / thematic center and the purpose of the educational activity:

- for exploration activities, observations of beings / plants / animals / objects from the immediate environment will be organized, experiments based on logical thinking will be performed, such as rolling objects on inclined surfaces, floating, falling, shadows at different times (hours) of the day; the natural educational resources will be manipulated by the students, thus developing both the logical-mathematical competence, but also the practical and social competences;

- an outdoor science and discovery center can be organized, where children can investigate materials found outdoors (various rocks, leaves, sticks, pods, seeds) using magnifying glasses, scissors, etc.;

- inductive learning will be stimulated for the development of scientific concepts (water cycle, plant species or solar energy, water mill, floating logs, transport of heavy objects);

- in the motor activities will be used construction materials, writing materials, objects will be made of natural materials, such as sand, clay, etc., board games will be made in the open space. The outdoor learning space will encourage creative play by using unconventional materials, which children can use for construction, such as recycled cardboard boxes, crates, PVC pipes, etc.;

- in the natural environment, students can express their creativity with nature as a visual support: they will paint walls or other objects in the natural environment. Natural materials could be used in an outdoor art area, where children can trace, draw, make frescoes or collage with these materials.

Application

Level	4th grade (9-10 y.o.)
Learning by thematic centers	
Learning task	Suggest educational resources that can be integrated into the educational process of developing key competencies in the "open air teaching" process
Trained/developed competence	literacy competence
Thematic center	
Educational resources	
Trained/developed competence	competence in science, technology, mathematics
Thematic center	
Educational resources	
Trained/developed competence	entrepreneurial competence
Thematic center	
Educational resources	
Trained/developed competence	personal, social and learning to learn competence
Thematic center	
Educational resources	
Trained/developed competence	competence in cultural awareness and expression
Thematic center	
Educational resources	
Trained/developed competence	citizenship skills
Thematic center	
Educational resources	
Trained/developed competence	digital competences
Thematic center	
Educational resources	

Management of the class in an outdoor education context

2.4

Outdoor activities should be planned and organized in such a way that they are "linked to school content" and the environment provides a way to "apply, test or experiment with knowledge set out in the school curriculum". (Șerban, G., 2014, p.21)

"There is more to you than you think!" was the motto of Kurt Hahn, the founder of the first school of Outdoor Experiential Education - ***Outward Bound*** - in 1941. In his opinion, modern society suffered from several "diseases", appearing as a negative setback of the evolution of technology: the decline of physical condition, entrepreneurship, imagination, creativity and practical skills, self-discipline and interpersonal compassion. The educational model of Hahn's school could be summarized in the following quote: "*I consider that the main task of education is to ensure the survival of the following qualities: an innovative curiosity, an invincible will, tenacity in reaching the goal, self-denial and above all: compassion!*".

Methodology

- **Format – *In what setting do I learn?*** – The education we receive in classical educational institutions is a formal one. Outdoor Education programs take place in nature and their purpose is not the attestations such as certificates and diplomas, but the visible changes in the behavior of participants. For this reason, Outdoor Education has a Non-Formal character.

- **Type of learning – *How do I learn?*** – Most of the time the education received at school has a purely theoretical aspect (Cognitive). No wonder when a teacher has to follow a very busy schedule and too little time available to teach it to 30 students. In Outdoor Education the student learns everything in a practical, active way, through personal experiences to which he then reflects in order to extract the teachings. This way of learning, characteristic of Outdoor Education, is called Experiential - You learn with your brain, hands and heart!

- **Objectives – *What do I learn?*** – Outdoor education addresses all three levels of learning: the level of knowledge accumulation (Cognitive), the level of physical skills (Motric) and the individualization of behavioral traits (Affective).

Depending on the chosen activities, the objectives of an Outdoor Education program can be part of any of these three categories. Thus, students can learn more about:

- the environment in which we carry out our activity, the relations between its components and how they can contribute to its protection
- one's own person, one's own limits and how I can overcome them
- effective communication and collaboration within a group

Characteristics of outdoor education

- *Outdoor education offers the possibility of direct contact with nature* – la salvaguardia dell'ambiente è un argomento di interesse globale. L'urbanizzazione di massa ha prodotto effetti dannosi sull'ambiente, e le persone non sono consapevoli dell'impatto che hanno i loro comportamenti non ecologici. L'insegnamento all'aria aperta può essere visto come un metodo estremamente utile per cambiare le abitudini e i comportamenti nei confronti dell'ambiente.

- *Outdoor education is a powerful source of learning experiences* – a relaxing, free environment without the constraints imposed by "the four walls of a classroom" can offer children countless challenges, so the educational process becomes powerful, inspiring and engaging. Nature to change antisocial behaviors, to create a strong relationship between children, based on mutual support.

- *Outdoor education facilitates the learning process of children with difficulties* – thus outdoor education offers a different learning climate that allows children who usually have learning difficulties and have a low level of school performance, to become motivated.

- *Outdoor education leads to the personal development* of both those who apply it and children.

- *Outdoor education contributes to the development of team spirit* – the connection between children-children, children-educators leads to increasing the degree of active participation.

- *Outdoor education offers countless physical, emotional and mental benefits* that ensure the well-being of society.

2.4.1. Management of non-formal activities

Outdoor education is considered to be much more motivating, stimulating and with a stronger impact on the learning process among students. In order to better understand what new outdoor education brings to the teaching-learning process, we will make a brief foray into the existing forms of education.

Non-formal education does not translate as an activity without a formative effect, but must be understood as a less formalized educational reality. The concept of non-formal education is associated with the concept of "lifelong learning".

Assessment in non-formal education is carried out by the learner, and the multidisciplinary approach to the learning process helps people to understand and appreciate the environment and their connection with it. It prepares students for a sustainable future, analyzes long-term problems.

Outdoor education folds best with non-formal education, because like this, outdoor education is very much based on active participation, maximizes the learning process, minimizes the specific constraint of the school, provides immediate practical utility to the knowledge learned, takes place in contexts different with a learning framework and easy content, uses methods that stimulate involvement and participation, has a flexible structure and planning, the learning process is participant-oriented, is based on the experience of the participants.

Both non-formal and outdoor education can be successfully integrated into formal education in order to maximize the effects of the learning process, the current trend is to amplify the two forms, especially because embedded, they lead to a system much more valuable in terms of quality, produce long-term advantages, cover a wide range of disciplines and most importantly, the educational act focuses equally on those who implement it (especially teachers) and those who the object of learning (in this case students).

In small classes (primary cycle) can take place in the form of themed trips, hikes, picnics, forays into the real world: park, forest, neighborhood, shopping center, botanical garden; observations in nature; participation in ecological projects; outdoor creative workshops (painting, drawing, dancing, pottery, etc.). The development of thematic projects throughout the school year is a good pretext for initiating and carrying out outdoor activities. Example: observing vegetables/flowers/fruits/animals or farms (cows) or households.

An example can be the thematic project "Autumn in colors-leaves in the park" - in the preparatory class, which aimed to acquire aspects specific to the autumn season starting from the basic colors red and yellow. In the first week, the children learned about the changes that took place in nature during the autumn season and implicitly observed the transformations of the trees during this season. It involved observing all the transformations that grass, trees, weather, the activity of children and people undergo. In math and

exploring the environment, the children took a walk (raid) in the park near the school in order to observe the color of the leaves and their size. They had the task of choosing and grouping small and large yellow leaves separately.

The aim of the activity: to consolidate the knowledge about the color yellow and size with the help of leaves and materials from nature.

Operational objectives: to collect only yellow leaves; to find a small and a large leaf, respecting the indicated yellow color.

This can be an outdoor activity that combines knowledge in the field of science (both environmental knowledge and mathematics) with that in the psychomotor field (running on a flat and varied terrain). Also, during the activity, the aim was to create a well-being of the child: the emotions, attitudes, behavior that he experiences when he solves a task without being asked to sit at the table and on the chair.

In the second (7-8 y.o.) And third grade (8-9 y.o.), an activity for decorating the kindergarten in the school park can be carried out during the AVAP classes. You can use pets, used tires, old flower pots, pebbles, wood from which you can get different shapes of animals, flowers that will give a pleasant effect to the space. Students can make these objects to decorate the space.

In the fourth grade (9-10 y.o.), such an activity may involve planting plants, shrubs, bushes. The activity would aim to consolidate the knowledge about the soil, soil types and its role, to consolidate the knowledge about plants, the composition of a plant, the role of each part of a plant, the stages of planting a plant. In the specially arranged space, in the kindergarten in the school park, the students will perform each stage under the guidance of the teacher.

2.4.2. Management of relationships between pupils and between pupils and the outdoor space

Outdoor education aims to develop socio-personal skills: improving team spirit, improving social relations, developing leadership skills, developing management skills: organization, coordination, evaluation, both those who apply it and students.

An important aspect of outdoor education is that it meets both the basic needs of the individual and those who specialize in the group to which he belongs:

- ***The need to be respected*** – carrying out various outdoor activities encourages the child to feel at ease, so he will be more open, will communicate, will express his own opinions, will feel noticed and will feel that his decisions matter to others; students can be consulted about different games or activities.

- ***The need to be responsible*** – outdoor activities give the child the opportunity to receive different tasks, responsibilities to achieve the proposed goal (for example if he opts for a greening activity, one child can be given the task of clearing trees, another task of to water the flowers, however, it is important that by communicating with the child, the teacher conveys to him the feeling that through what he does, the environment will be cleaner, so he will realize that he has a responsibility to protect the environment).

- ***The need to be active*** – involvement in various sports activities, games, themed walks, brings many benefits to the child's physical and mental development. The game being the fundamental activity of the child, it is important for all children to be constantly stimulated to play, to run, to participate in different activities actively.

- ***The need to be socially included*** – perhaps the most important feature of outdoor education is that it is a successful way to overcome some of the child's difficulties (mental, physical, social, emotional or economic) so that he is socially included , to feel that he belongs to a community; it is considered that the environment inside the group is rather a competitive one, while the one outside the classroom is a supportive one, which allows children to express themselves, to relate to others, to collaborate.

- ***The need to feel safe*** – the inside of the classroom is much safer for children, while the outside environment involves various risks and unforeseen situations that can have a negative effect. The educator must identify the possible risks that may arise and design a risk management plan, as it is a particularly important aspect that has led some specialists in the field to deny the usefulness of using outdoor education.

These activities prepare children to face life's challenges: they arouse their interest in participating in new and complex tasks, they encourage them not to be afraid of unpredictable situations and to find the best solution, they develop their communication skills being oriented towards cooperation and collaboration, without which the common goal of the team cannot be achieved.

2.4.3. Strategies for students with special needs

The choice and application of a teaching strategy in a formal or non-formal activity is an act of personal decision of the teacher, who selects certain teaching methods and procedures, teaching means and forms of organizing the activity with students in order to achieve the proposed objectives. "It depends on the teacher's skills and qualities, as well as on many other factors, including: the scientific content of the lesson to be taught, the skills mentioned in the curriculum, available teaching resources, age and individual characteristics of students, class characteristics of students etc." (Petruța, 2018)

In selecting the teaching strategy, it is recommended that the teacher consider the fact that each student is unique and has a certain intelligence profile composed of the nine different intelligences mentioned by Gardner (verbal/linguistic, logical/mathematical, visual/spatial, musical/rhythmic, bodily/kinesthetic, naturalistic, interpersonal, intrapersonal, and existential intelligence), of which only one or two intelligences are developed (strong). The teacher must also consider students' learning styles.

Currently, for the understanding and acquisition by young schoolchildren of the notions of natural sciences, the teacher can use in formal and non-formal activities, with physically and intellectually developed students, as well as with students with various disabilities, both active learning strategies, as well as cooperative learning strategies, with the possibility to use the most appropriate methods from the diversified range of existing teaching methods. Both of the above teaching strategies are student-centered and "focus on facilitating learning." (Cojocariu, 2009).

Active learning strategies allow the student to actively intervene on the material to be studied, to have a direct contact with it. The student is stimulated to actively participate in the learning process by applying active-participatory methods, such as heuristic methods (e.g., observation, experiment, problem solving, modeling, etc.) And methods based on practical action, e.g., practical work (Cerghit, 2006).

Collaborative or cooperative learning strategies are based on teamwork. This stimulates an interactive or interdependent group learning. The interactive methods that can be applied within these strategies presume the existence of the students' desire to cooperate and collaborate. The group can consist of a maximum of four students, who will be trained in solving joint tasks. Cooperation is "a form of learning, study, interpersonal / intergroup mutual action" that focuses on the process of accomplishing the task. Collaboration is "a form of relationship between students [...], which consists in solving problems of common interest, in which each contributes actively and effectively" (Oprea, 2009).

The involvement of students with certain disabilities in learning activities requires a very good knowledge of their specific problems. It is advisable for the teacher to know the severity of each student's illness, how it manifests in general and how he or she might be helped to learn, considering what he or she can and cannot do at some point. It should

be noted that a certain disease can affect students in different ways, and the decision to assign a certain task to a student with special educational needs remains at the choice of the teacher. In the previous chapters, the work tasks that we appreciate that students with certain disabilities could perform were marked with an asterisk.

In order to participate in one of the activities described in the previous chapters, students with disabilities will be consulted beforehand and their desire will be considered. The work tasks will be clearly explained, until they are fully understood by the students. During the activity, they will be guided and encouraged whenever necessary, and at the end they will be appreciated if there is the slightest progress in learning the notions of natural sciences.

Below is an example of a teaching activity that can be done with eco-sensory students.

Scenario of eco-sensory classes

For students with mild and moderate intellectual disability

Topic: Sounds, smells and touch of nature

The main aim of the course is to increase environmental awareness and improve polysensorial functioning of students with mild and moderate intellectual disabilities.

Classes, due to their specificity, may be held in spring and summer months.

General goals

- developing tactile perception
- developing auditory perception
- developing olfactory perception
- strengthening concentration and attention
- strengthening perceptiveness

Detailed objectives

- encouraging students to observe nature
- improving the senses in contact with nature
- developing sensitivity to various aspects of the living world
- increasing environmental awareness

Methods

- a talk
- work with drawings and photos
- polysensorial method

Teaching aids

- work cards
- photos of plants
- herbaceous plants and trees growing in the wild garden
- garden insects
- birds foraging and nesting in the garden

Course of classes

Welcome

The teacher welcomes students to the wild garden, briefly talks about the place and encourages their involvement in the activities. The teacher talks about the role of nature and the different senses that help to experience nature.

1. "Smell of nature"

The teacher walks with the students to the part of the garden where medicinal and honey plants grow. Teacher shows these plants in pictures and encourages students to find them in the garden.

Origanum vulgare Marjoram	
Mentha Mint	

Melissa officinalis Lemon balm	
Thymus spp Thyme	
Salvia officinalis Sage	

The teacher asks the students if it is easy to recognize plants from photos? Or maybe some other sense will be more useful here? (e.g. Smell).

Then he plucks one leaf from each plant, gives it to the students one by one and asks for the smell (pleasant/unpleasant, strong/weak smell).

Depending on the students' abilities, students can be asked to share their associations with a given smell, e.g. Mint - candy, toothpaste.

2. "Sounds of nature"

The students go to those areas of the wild garden with feed places or collections of water and some animal species can eat or drink.

They close their eyes. They try to isolate the surrounding sounds and associate them with a specific group of organisms (insects, birds).

What are the sounds?

- Pleasant/unpleasant, do they evoke positive associations or rather anxiety?
- Students share their experiences

Students approach the part of the garden where you can find the largest number of insects.

They close their eyes and listen to the world of insects.

- Do they hear different sounds made by different groups of insects?
- Do all insects sound the same?
- How many insects can count based on the sounds they hear?

3. "Touch of nature"

The students go, if available, to the part of the garden with conifers and deciduous trees. They touch needles and leaves. They try to feel the difference between the needles of pine, fir, spruce, yew. Do all needles prick the same?

Pinus sylvestris Scots pine	
Abies alba Silver fir	
Picea abies Norway spruce	
Taxus baccata Common yew	

End of classes

At the end of the lesson, students draw pictures of their experiences from the wild garden lesson.

What were the most memorable for the student - sounds, tactile sensations or smell?

Example

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