



BEEsiness

Beekeeping as a
way of education

Imprint

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Useful insect

Sure you have heard today already notoriously famous quote of Albert Einstein which says that “if bees disappear from the Earth, only four years remain to humankind”. It might be not important who said it but whether it is true and important. As up to 81 per cent of plants are pollinated by insect, the quote is becoming worth of large attention. One third of what we eat is thank to bees.

Bees

First association which comes with the word bee is usually honey – sweet food. Bees provide more important service to us. One third of all that we eat must have been pollinated – fruits, vegetable, nuts, but also delicacies like coffee. Because of fine hair which bees have on their bodies parts of pollen stick to their bodies and they also stack to special

cells on the third pair of their legs which they bear to the beehive. When visiting another flower, the parts of pollen from their body surface get on the pistil and the fruit can come into being. Bees also „clothe“ us, one of the products on their list is also cotton, which had to be pollinated too. Bees together with bumblebees and silk-worm are the only insect

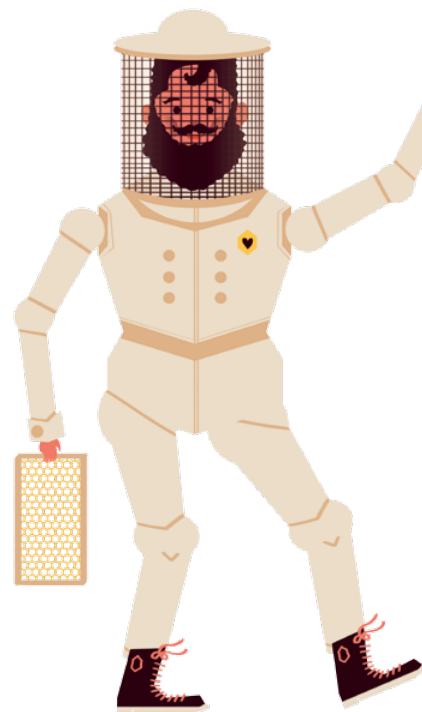
“if bees disappear from the Earth, only four years remain to humankind”

classified as useful farm animals. Bees provide us many products for healing and beauty, except of honey also propolis, royal jelly or pollen. Honey is effective for healing arthritis. Bees have also other utilization. In Croatia bees are trained by adding blasting powder into honey for search of mine fields, villages in Africa are protected by fences with beehives to protect themselves and the possession from elephants who are scared of bees. Honey poison can defuse HIV virus when it enters a body.

A bee collects pollen or nectar of one kind of a plant until it finds a bigger source. It is very important in pollinating agricultural fruits. Bees inform each other about the position of the source by means of a bee dance. From it they can understand the direction and distance, even the productivity and taste of the target plant. Thousands of bees of one beehive fly daily to collect nectar and pollen. Nectar from the flowers or honeydew serves bees as an energy source and they collect pollen from flowers as a priceless source of proteins especially for their larvae. One bee flies out of a beehive 12 times a day and visits thousands of flowers. Bee literally dies of tiredness and usage after it flies more than 800 km during its life. Honey bee lives in a highly organized society. The largest amount consists of worker bees. In one beehive there is 40 to 60 thousand of them during a season. (2) Bees do not sleep. Their life during the season is restricted to 4-5 weeks. They take care of the beehive, protect it, and carry the stock of pollen,

water and nectar, out of which honey is made. Long-aged winter bees live 6 to 9 months and their task is to overwinter the colony of bees to the next year. They are associated by the bee mother. She lays eggs and then worker bees are born or even drones in case of need. Bee mother is literally an egg-laying machine, capable of producing even 2000 eggs during a season. She lives 3 years at an average but even 7 year old record breakers have been found in the nature. Bee male is called a drone. It can be easily distinguished from a worker bee. Drones have much larger eyes so that they can, during the wedding flight when they are going to breed, easily distinguish the bee mother. Except of that they have a much larger body which is more hairy and they buzz loudly while flying. Drones are fed by worker bees as they cannot feed themselves on their own. Drones do not take part in the pollinating. Their main function is to fertilize the mother. A drone except of this function also heats the brood. They are only about few

hundred in the hive, only during the main season. When they become redundant, bees stop feeding them and weak as they are they are simply carried out of the hive where they are left for birds to eat or gradually die.



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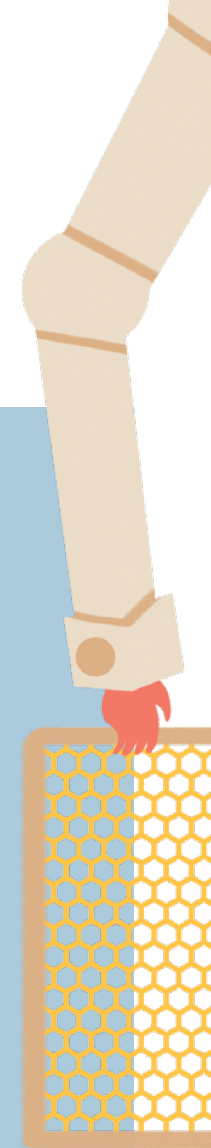


Bumble bees

Sure you have noticed loudly buzzing dumpy bumble bees that can be heard from early beginning of spring. Bumble bees belong among typical representatives of pigeon horntail. So far about 300 species are described, most of them are rare, and some are critically endangered or extinguished. There is about 26 species living in our area. Among the most well known species living in our area belong large earth bumblebee, garden bumblebee, common carder bee, red-tailed bumblebee, white-tailed bumblebee and early bumblebee. Bumble bees are extremely important in our food chain. In contrast to bees they are able to fly and pollinate even in rough conditions when the weather is cold, rainy and cloudy. It makes them excellent pollinators of native species of plants and native

crops. Bumble bees thanks to their longer proboscis can get nectar even from plants which bees cannot. They pollinate flowers with longer calyx or hidden nectary. Bumble bees have hairy bodies and the pollen can easily stick to it. Despite of their dumpy body structure and short wings which makes them look clumsy, they are very good flyers. They can fly 20 km in an hour and their wings can makes 200 moves in a second. They are very good in adapting to difficult alpine conditions. In Himalayas there are bumble bees that live naturally in altitude up to 5600 m above sea level. Bumble bees also act commercially, because in contrast to bees they are able to live in closed spaces and so they become excellent pollinators of plants cultivated in greenhouses.

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Solitary bees

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their nests in to the soil, carpenter bees that are nesting in wood and grass stems, leafcutter bees, hairy-footed flower bees, mason bees and many more. One of the largest bees violet carpenter bee, which reaches the size of bumble bees, also belongs among solitary bees. It builds its nest in the old wood and both male and female take care of its brood. Many of solitary bees are great pollinators of fruit gardens for its short flight range, which keeps them inside of the garden. These bees are devoted to its surrounding; they fly even in cold and cloudy weather because they do not mind rain and cold.





Butterflies

Butterflies form one of the most diverse group of pollinators. In Slovakia live about 3500 kinds of various butterflies. Despite of many kinds of butterflies living in this area, many of them are endangered. For example Mountain Apollo (*Parnassius apollo*), Clouded Apollo butterfly (*Parnassius mnemosyne*), Large Copper (*Lycaena dispar*), Scarce Fritillary (*Euphydryas maturna*) or Heath Fritillary (*Melitaea athalia*) belong to the group of endangered butterflies. Butterflies also feed themselves with nectar, pollen stick to their legs when flying from one flower to another, which makes them contribute to pollinating. They are secondary pollinators, they do not pollinate as effectively as bees and bumblebees but still they are helpful pollinators. Butterflies develop through complete metamorphosis, which means they undergo various forms starting from an egg, larva, pupa and imago

in their lives. Life of a butterfly begins when a fertilized female lays eggs to a host plant, out of which clumsy larvae hatch. Larva later pupates and starts sucking air which fills the wrinkled wings. They gradually gain definite shape and size. This process lasts several minutes and depends on the size of a butterfly. A butterfly remains few minutes on the same place until its wings completely freeze and gain the necessary consistency. This is how an adult butterfly comes to being. Group of butterflies is very diverse and various not only in its colouring and lively drawings on the wings but also because the length of life or the look and structure of the body. Sure you have noticed a flying wonder resembling a hummingbird. Even in this case it is a butterfly called Hummingbird Hawk-moth (*Macroglossum stellatarum*) which pollinates flowers and can fly even 18km/h.

True flies (Two winged flies)

When hearing the work "fly" it is mostly negative associations which come with it, such as annoying insect, flycatcher, dirt. This association is connected with house-fly which is only a drop in the sea of 120 00 known species of true flies. They have no hair, like for example bees where it serves for catching pollen, despite of it some kinds are great pollinators. 150 million years ago they were the greatest heroes of pollinating (together with bugs). Bees did not exist back then and it was flies that pollinated. They visit flow-

ers because of their nectar – source of sugar, which provides them energy and sometimes because of pollen, source of proteins, necessary for their reproduction. The most well-known pollinators among flies are hover-flies called flower flies in other countries. They are 4 to 25 mm large; they resemble bees or wasps in their appearance, which is the reason why we mistake them often. They use the similarity for their own protection. They have no sting, but can effectively lure away birds or other predators from

being eaten. During flight they resemble a helicopter; they fly over a flower from the front, back and even from sides. They can be found in gardens, where they contribute to pollinating fruit trees and bushes, strawberries, but also black thorns, wild roses and elderflowers. Even annoying mosquitoes belonging to the group of true flies, who suck our blood, are useful pollinators. To be more exact – males. In contrast to females, which are fed on blood sucking, males prefer nectar.






Other pollinators

Bugs incorporate the greatest amount of pollinators. In the past they also belonged among the first flower pollinators and they are irreplaceable pollinators even today. They search for spicy, sweet flower fragrances. The best example of bugs – pollinators is a magnolia tree, where bugs are the main pollinators. They are willing to bite their way through flower leaves and other parts of the plant standing in their way. Bugs are on flowers less active than bees and bumblebees, which is why they belong to the group of secondary pollinators. Still we have little knowledge about the influence of bugs in plant pollination. To the group of bugs taking part in pollinating belong click beetles, scarab beetles, checkered

beetles, sap beetles, leaf beetles and so on. Even some kinds of wasps visit flowers. Their body without hair does not make them good pollinators. It is a group of honey wasps which feeds its larvae with nectar and pollen. Slovak native orchid *Epipactis helleborine* is pollinated by Common Wasp (*Vespula vulgaris*) and Yellowjacket Wasp (*Paravespula germanica*). Small fig wasp pollinates figs. Pollinating is really a very fiddling work and even ants contribute its part to it. They take minimal part in pollinating but still they carry pollen from the flowers. They do not live in our conditions but in other countries live pollinators such as colibri, exotic birds, bats fed by nectar, or opossums.



Bugs, wasps and ants are secondary pollinators. Their part in pollinating is not so obvious, but for certain kinds of plants it is irreplaceable.



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Wind pollination

Only 10 percent of plants are pollinated without the assistance of animals. The most common type of pollination that is not done by animate nature is wind pollination. Especially grass, coniferous trees and other deciduous trees are pollinated this way. Some water plants release pollen into water and the pollination is done by means of water.

Human

Last pollinator is a human. But he in contrast to the other pollinators gets paid for the job. Imagine a situation where all of the plants would need to be pollinated manually. Edibles would be less available and their price would rise rapidly. Estimated price of total harvest which bees pollinate is about 15 billion dollars a year. Chinese province Sichuan lost its pollinators due to pesticides, so since 1980s pear gardens are pollinated manually. If for example USA had to substitute all pollinators by humans, it would cost the country 90 million dollars each year. Manual pollination by humans is done anyway but only if normal pollination is insufficient or undesired and it is done only in small areas. The main reason is usually the effort to stop the cross breeding of different species. A brush is used for carrying the pollen.



Houses for insect

Sure you have noticed flying bumble bees, colourful flies, bees and other important insect during a walk or in a school area. Lately, possibilities where insect can create appropriate conditions for nidification are disappearing. Nevertheless, not all bees live in large colonies. Many kinds of bees live in solitary way, so to help them you do not need a whole bee hive and you do not need to start bee-keeping neither. The easiest way how to help pollinators irreplaceable for our life is to create a house for insect for them.

Many students of different age can take part in creating such a "hotel for insect". Based on abilities and skills of the students the appearance and construction of the house for insect will depend. Many useful pollinators search for hollows in walls, heaps of dry cut branches or even old abandoned nests after mice or other rodents. When you create a simple

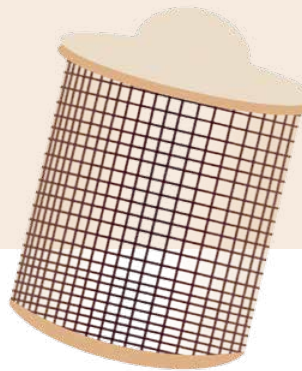
house, you can place it in the school area and with students observe how pollinators gradually settle in their new homes. In hollows of a created house you can observe how first guests are moving into the house, how they carry leaves, filth and other material to adjust the hollows to their needs. Pollinators will gradually lay eggs and new brood will hatch. To-

gether with students you can create notebooks where students will write down what is happening in the houses – they can search in books or internet what kind of pollinator is living in the house, what is its activity, when new bees started hatching and so on. Hotel for insect can be placed to where its inhabitants will not be disturbed, where it will not be in



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house in winter; only larvae of pollinators will be there, which start hatching in spring. It would be advisable to protect it against dampness in winter by placing the house under a roof.





Useful insect will surely appreciate the new housing and you will decorate the school area at the same time.

How to do it

House for insect made of branches for the smallest children

Creating such a house for pollinators is very easy, so even the smallest children can take part in it. For building the house you will need only hollow bars or bamboo sticks, optionally thick straws. Tape a bunch of these sticks into one piece and hang it in a sunny and dry place. House inhabitants will accommodate in the holes of the sticks or gaps between them in the spring time.

Bamboo house applicable to all age groups

Construction of this house is very easy, so even small children can handle it but decoration of these houses can be interesting even for the older ones. For creating such a house you will need various dry branches or bamboo sticks, a piece of a plastic bag, PVC tube or a large empty can. Fill the PVC tube long about 10 - 15 cm or a can with sticks and branches of the same length so that they firmly hold in the tube or the can. If you use a PVC tube for crea-

ting the house, tie a cord through it first so that you can hang the house, afterwards put a piece of a thicker plastic bag so that a part of the house remains covered. If both ends remain hollow, insect will not settle in. Start filling it with sticks next. If you decide to create the house of an empty can, you can tie the cord through the can. You can paint the house according to your fantasy. Useful insect will surely appreciate the new housing and you will decorate the school area at the same time.

Drilled house for older children

Older children can create such houses from pieces of wooden logs or thicker pales. You only need to drill several openings into the wooden log wide about 8-13 mm. You can paint the house using ecological paints but be careful the paint does not leak into the openings; its inhabitants might not like it.



Residential area for pollinators

If you feel like creating something bigger for pollinators than just a house for an insect, you can create a whole "residential area". You can use an old redundant drawer which you will fill with the students by old bricks with holes, branches or pieces of wood with drilled openings. You can use anything you find with openings which might serve pollinators as suitable places for nidification. This way you can create a whole wall serving as a house for useful insect.



If you feel like creating something bigger for pollinators than just a house for an insect, you can create a whole “residential area”.



Our experience

We created all kinds of houses with pupils. With pupils from two kindergartens aged 3 - 5 years we created houses made of PVC tubes. We helped the smallest children with shortening the sticks they used for filling in the tubes, for the rest they worked on their own. Children enjoyed the work and they were curious what would happen with the houses after they are finished. We created the same houses with children aged 9 - 11 years. They worked individually, took their houses home where they observe the life inside. The simple and playful approach proved as a good way to increase interest of the children and getting them closer to nature by observing and helping at the same time.

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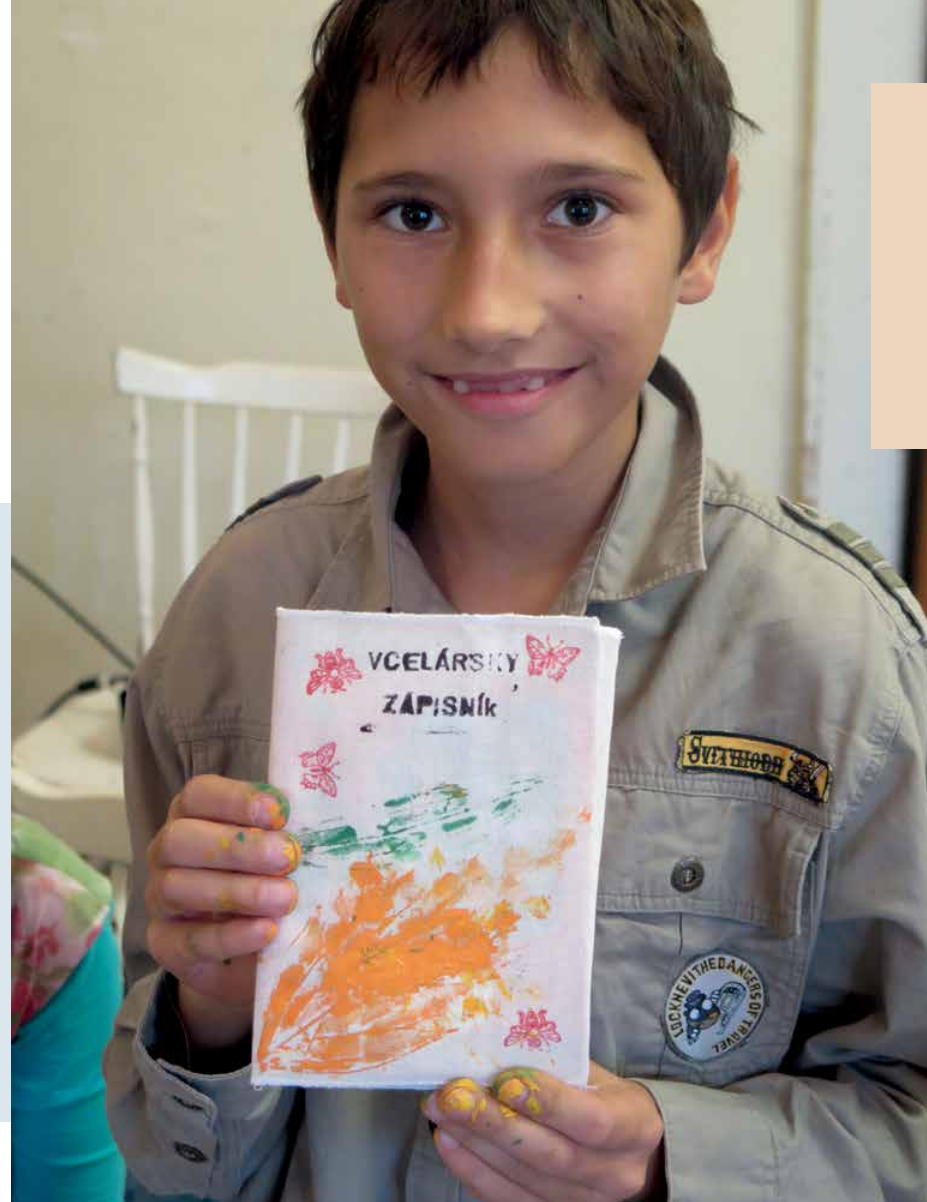
Bee gardens

In the previous chapters we introduced the most well known pollinators and the easiest ways how to help them. If you have an opportunity to create a flowerbed at school, engage the students to create “bee gardens”. If it is possible, create a colourful flowerbed in the school area which will by its fragrance and bright colours attract useful insect. You can start preparing the flowerbed at the beginning of the year.

Together with children choose plants that will provide enough nourishing pollen and nectar for the pollinators. Most of these plants is useful not only for the pollinators but it is also very attractive by its look so planting such a flowerbed will be useful not only for the insect but you will beautify the school area too. Shops selling garden equipment or garden centres offer a wide selection of flower seeds which would perfectly fit this purpose. You can explain the students the whole work procedure when creating a “bee garden” during winter. You can start by asking the students to put off plastic crucibles where

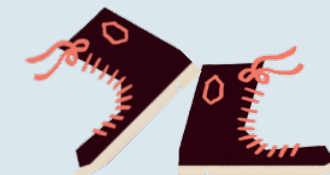
you will later plant the seeds. You can also buy nurselings of blooming perennials but if you grow the plants by sowing the seeds, not only you will save money but students will take part in the process from its very beginning. Students taking care for the flower seedlings gain new experience and grow deeper relationship with nature. To observe the gradual development of plants from seed to flowering plant itself is an extraordinary experience. Students thus gain insight into how plants develop, and by regular caring for seedlings build a sense of responsibility. Sow into pots just

a few seeds or later, when the plantlets are bigger, separate them individually. In the spring, when the plants are large and strong enough, after night frosts start with site preparation for the bee flowerbed. Engage all students to work on the crop. If you’re making an insect flowerbed in area where the grass grew before, spade it in advance. Older pupils can spade the land themselves. Also younger children can handle plucking weeds, beside that they learn to distinguish useful and unwanted plants. To the pre-dug holes you can then plant the seedlings together. After planting the



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plants remember to water the crops well. Give students regular shifts in taking care for the plants - pluck the weeds around the plants and water them. Later you can watch together how well the plants are doing, how they gradually bloom and which types of pollinators do they attract. You can prepare an observing journal, where you will make notes about what is happening with the insect in the flowerbed, you can even compare and evaluate the notes annually. You can implement bee garden making within the natural science classes, on the occasion of Earth Day and so on.



Our Experience

We have managed to implement the „bee flowerbed“ in cooperation with Kindergarten in Kokava nad Rimavicou. We included children of the age 5 years to the project. We started organizing the project at the occasion of Earth Day where we discussed with the students the problems of environment, usage of blooming flowers and pollinators and their connection. We also talked about possible solutions that we can make on our own. Together with the students we planted a bright flower mixture of perennials and annual plants attracting

useful insects into large pots. We also created pot decorations made of cork in the shape of bees which we decorated the pots filled with planted flowers. Students were watering the plants during the following two months and they observed how the plants started growing out of seeds. When the plants were big enough we planted them into a prepared flowerbed. First we dug up the flowerbed, together with the students we got rid of the unwanted plants and we planted the flower nurslings into the holes. First we explained the children

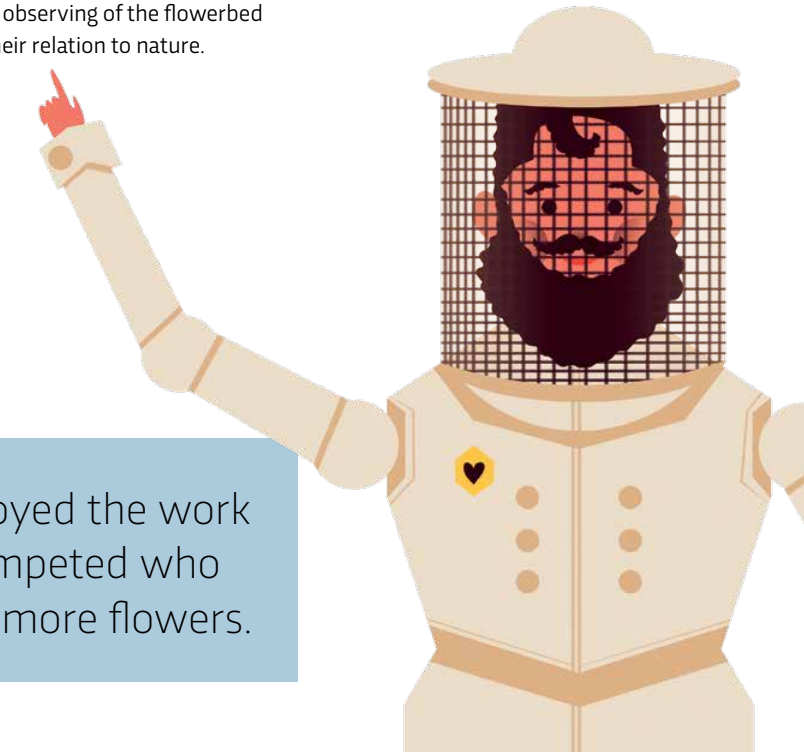


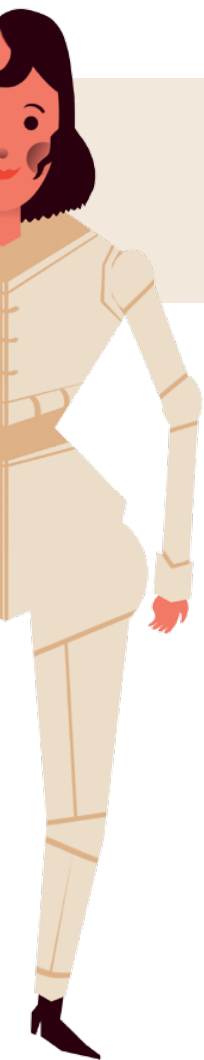
how to proceed, how to deal with the plants, we showed them the parts of the plants and explained their importance. The experience of working with plants was completely new to some of the children so it was necessary to explain where the plant has its root, what is it for, which part we put to the ground and where is the top of the plant. We also explained that it is important to hold the flower gently and to dig the plant gently to the ground too so that we do not damage it. Children enjoyed the work and they competed who would plant



more flowers. At the end children watered the plants using watering cans and where necessary we watered more. The planted flowerbed is doing fine and it acts as it was meant to – decorates the school area, attracts useful insect which children can observe and at the same time it also fulfils its educational function as children gain new knowledge and skills and by regular care and life observing of the flowerbed they build their relation to nature.

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Bee plants

If you have decided to help bees and other pollinators by preparing a “bee buffet”, choose plants which provide enough pollen and nectar that can serve as a great source of nutrition for useful insect. If you have an opportunity at school, try growing plants that will bloom gradually and so they will serve as a source of nutrition for pollinators during the whole vegetation season. You can choose from a wide selection of trees, bushes, perennials or even healing plants. Kids can take care of them and gradually learn about their usage, fragrance, shape and change during the year. Choose mostly native plants or those which accommodated to our conditions, in no case choose plants which are invasive or act invasively.



Woody plants

If you have an opportunity to plant trees or even an alley or garden of trees you can choose from deciduous or coniferous trees. Among recommended deciduous trees belong our native trees like lime wood, hazel, maple, alder or willow. Common hazel (*Corylus avellana L.*) is a very important bee tree, because it belongs among first pollen-giving plants in spring time and so it serves first forage to bees. In our area it mostly occurs as a bush of 4-6m high but it is often planted in gardens as a fruit tree. You can produce hazels just like willows on your own by planting hazel or willow withies into ground so that they can after continuous watering soon take roots. Willow (*Salix L.*) is a very often shrub in our area which can also exist in a form of a shrub or a tree. Willows are dieicious but both male and female flowers produce enough nectar for bees. Just like hazels, willows are also very important for their early spring bloom and

so they provide enough pollen and nectar for bees at the beginning of a vegetation period. Number of spring pollen is also provided by elm tree, maple and alder. Later blooming tree with beautiful and fragrant flower is lime (*Tilia*). It is our native tree which can reach a very high age and in favourable climatic conditions produces a lot of nectar. It also provides a lot of honeydew from aphid which can often be seen on the bottom side of the lime leaves. Limes provide less pollen. If you choose coniferous trees, remember they will change the pH of the ground by its fallen needles and grass will stop growing under the trees. Some co-

niferous trees is very favourable as a source of nutrition for pollinators. For example white fir (*Abies alba Mill.*) is considered one of the most productive bee attracting plants among all coniferous trees. Bees collect also fir honeydew in case of abundance of louses on the firs. Common spruce (*Picea abies L.*) belongs to the group of most expanded trees in Slovakia and it provides a lot of honeydew, propolis but also pollen for bees. Even fruit trees are very tempting and useful for insect but many of them bloom early or they get harmed by spring frost when the flowers freeze and they become a limited source of nutrition for

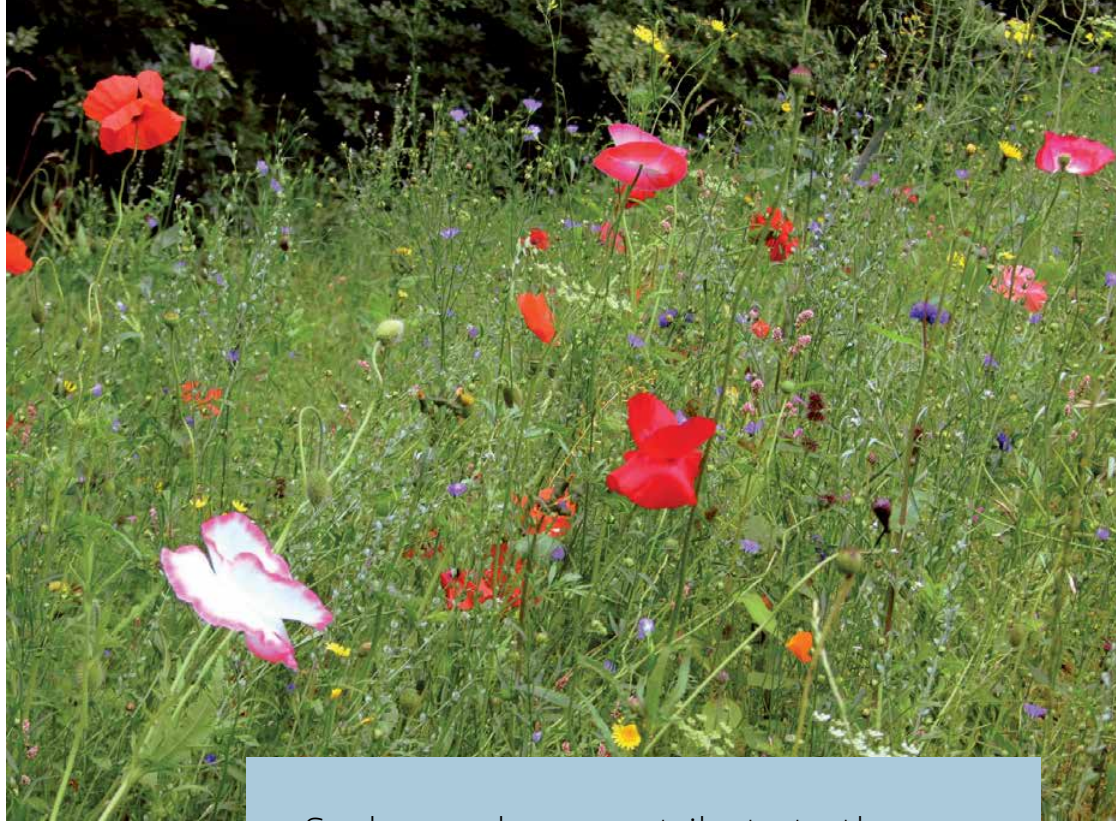
pollinators. Cherry tree, apple tree, pear tree, peach tree and apricot tree produce a lot of pollen and nectar, plum tree produces the least amount of nectar when compared to other fruit trees, which is only secreted in favourable weather. Many trees or herbs that are important for pollinators are invasive at the same time, therefore consider its planting and the environmental risk for broader environment. Among these plants belong white acacia (*Robinia pseudoacacia L.*), paulownia tree (*Paulownia tomentosa Thunb.*), milkweed (*Asclepias syriaca L.*), giant goldenrod (*Solidago gigantea Ait.*), Canadian goldenrod (*Solidago canadensis L.*).

Among recommended deciduous trees belong our native trees like lime wood, hazel, maple, alder or willow.



Flower meadows

You can help pollinators also by planting so called flower meadows. If your school contains a large grassy area, which does not provide shelter and food for insects or small animals, moreover, it needs to be mowed regularly, try to replace it with the flower meadow. Today we can get a blended mixture of flowering meadow plant seeds - perennials, clovers and annual plants, which by their colour and species diversity are a pleasing revival of our parks and gardens, plus they provide sufficient amount of pollen and nectar for pollinators. Such meadows contribute to the diversity of nature and it is very interesting to see how the surroundings of your school come to life. In addition, you don't have to mow such plantings every week, few times per season is enough, so ultimately you will save your school maintenance budget.



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Flowering perennials

With pupils you can also plant a perennial flowerbed, which will bloom from spring to fall. Very rich on pollen and nectar, in spring flowering plant is a pretty blue coloured bulb grape hyacinth (*Muscari racemosum L.*) and yellow flowering winter aconite (*Eranthis hyemalis Salisb.*). In late May, siberian iris (*Iris sibirica L.*) begins to bloom, one of the good pollen and nectar giving plants. In May blue cornflower (*Centaurea cyanus L.*) blooms. Several species of cornflowers rank among the outstanding pollen and nectar giving plants that bloom long and provide a relatively large amount of nectar. Bees until late autumn collect pollen rich in nitrogen. In June orange flowers of orange lily (*Lilium bulbiferum L.*) begin to bloom, which produce a lot of pollen that bees like to collect. During the whole summer you will have rich red, pink and cream flowered beebalm

(*Monarda didyma L.*) blooming. It is a perennial and aromatic plant, very suitable for bees, bumblebees and butterflies. Spiked seedwell (*Veronica spicata L.*) is a perennial decorative by its flowers that

bloom in large number of small florets arranged into a spike. It blooms from June to August and occurs in different shades of purple and pink. From the beekeeping point of view seedwell is an excellent nectar plant. The flowers are easily acces-





sible to bees and other insects. However, it provides less pollen. Peach-leaved bellflower (*Campanula persicifolia* L.) is a plant occurring naturally in the wild, but it is also popular as a decorative plant for flowerbeds for its decorative violet or white flowers. It blooms from June to August with scyphiform flowers - bells. In flowerbeds it sets seed and spreads easily. Bells are attractive to the bees that collect both pollen and nectar. Besides peach-leaved bellflower there are other bellflowers interesting for bees like garden bellflower, clustered bellflower, Carpathian bellflower and creeping bellflower. From July to August yellow flowers of sword leaf inula (*Inula ensifolia* L.) will bloom in your crops, which is an excellent perennial nectar and pollen giver. Wonderful is also the biennial hollyhock (*Alcea rosea* L.), common in rural gardens. The flowers are white, pink, dark red or yellow, and bloom all summer. The flowers produce a large amount of nectar; therefore it's a great bee friendly plant. But in the pollen point of view, it is not interesting to bees. Great globe-thistle (*Echinops sphaerocephalus* L.) blooms from July till September

and is frequently visited by bees because it provides a large amount of pollen and nectar. This plant is an important source of nutrition of bees during the summer. A popular low maintenance perennial plant is orange coneflower (*Rudbeckia fulgida* Aiton.). Richly blooms from July until late summer with vibrant yellow flowers with black centre and is a great attraction for bees, butterflies and other beneficial insects. Attractive to pollinators is also black-eyed-susan (*Rudbeckia hirta* L.). One of the last great source of pollen and nectar from late summer until late fall is New York aster (*Aster novi-Belgium* L.) as well as other types of asters.

If you decide to establish an herb bed with students, where you will learn how to use different plants in the kitchen or medicine, prefer choosing herbs popular also amongst the insects.

Herb flowerbed

If you decide to establish an herb bed with students, where you will learn how to use different plants in the kitchen or medicine, prefer choosing herbs popular also amongst the insects. Such plant is for example basil (*Ocimum basilicum* L.). Although wild thyme (*Thymus serpyllum* L.) doesn't have a significant beekeeping value, it's a good nectar and pollen giving plant popular for its use in the kitchen. Another useful herb is wild garlic (*Allium ursinum* L.). It is a forest plant but lately it is increasingly popular for its good use in the kitchen. Wild garlic blooms in April - May and belongs among the excellent pollen and nectar giving plants. The pollen and nectar even honey have a distinct garlic fragrance which after some time disappears. Chives (*Allium schoenoprasum* L.) are grown as a plant irreplaceable in the preparation of many dishes. In addition, it is also a great nectar rich plant for

bees. It blooms from July to August. Also very popular in gardens is hybrid Faassen's catnip (*Nepeta x faassennii*), which blooms purple flowers throughout the summer. It has aromatic leaves and is outstanding nectar rich plant bees like to visit. Lavender (*Lavandula angustifolia* Mill.) is a woody perennial flowering very aromatic purple, but also white or pink flowers. Blooms in July - August. Here it is grown as an ornamental, but also a medicinal herb, moreover, is among the excellent pollen and nectar rich plants. Marjoram (*Majorana hortensis* Moench.) is an annual, sometimes biennial plant. It is grown mainly as a spice of aromatic taste and smell, and it's also good pollen and nectar rich plant. Mint (*Mentha* sp.) occurs in several types whether as herb of meadows and fens, or grown in gardens as a medicinal plant. It is an excellent nectar rich plant; however bees collect mint pol-

len less. Lemon balm (*Melissa officinalis* L.) is a perennial known for its lemon scent is popular medicinal herbs for teas. Has a soothing effect, helps with insomnia and to relieve stomach or intestinal problems. From beekeeping point of view, however, it is not among the excellent honey plants, it makes only a small amount of nectar. Although it is often visited by bees, probably because of its fragrance. It also gives a little pollen. Oregano (*Origanum vulgare* L.) is a favourite plant often used in the kitchen, but also with medicinal effects. From the beekeeping point of view it is a good nectar plant. You can also plant rosemary (*Rosmarinus officinalis* L.) which is very sensitive to frost, but is grown as a spice and medicinal plant. It is an excellent nectar plant.

Creative workshops

You can also make some practical or decorative bee themed items with students. Pupils will have fun, learn new skills and expand their knowledge about bees, pollination and other beneficial insects in a creative way.



Our experience

Through workshops with pupils of various age we produce decorative items related to the life and importance of bees. Pupils from kindergartens, primary as well as secondary schools had fun with simple to build manufactured objects. Of course, we helped youngest children with tasks requiring motoric skills, such as cutting. Older students worked independently and engaged also own imagination when finishing their products. However they enjoyed the workshop and meanwhile we talked about and explained various topics related to life and importance of bees. To explain the pollination of plants and clarifying the close relationship between plants and bees we produced simple decorations for flower pots in form of bees made of corks. To make such decorations we needed corks, wooden skewers, white paper, scissors, knife, brush, acrylic or tempera paints,

black marker and black tape. Stick the skewer to the middle of the side of the cork first. Then dye the cork with acrylic or tempera paints to yellow or orange. While you wait for paint to dry, you can cut wings out of paper. You can prepare wings for younger students in advance; older pupils have to cut them themselves. When the paint is dry, make a cut into upper part of the cork to place wings into.

Cut narrow stripes of black adhesive tape and stick them around the cork - it will be the stripes of the bee. You can stick the wings inside the cut. Draw bee's face on the round side of the cork and the simple flower pot decoration is done. Such decoration can be used as a tool in explaining of how a bee flies from flower to flower, collecting nectar and pollinating plants.

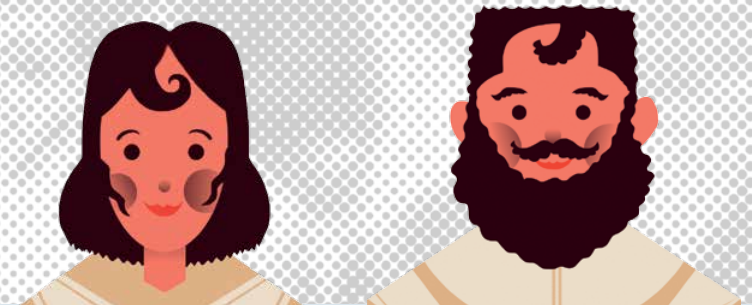
Pupils will have fun, learn new skills and expand their knowledge about bees, pollination and other beneficial insects in a creative way.



Pupils can also make “bee visors” out of paper. During the work you can explain the life of a honeybee. Production of bee visors can be handled by all grades of pupils, ranging from kindergartens to secondary schools, but it’s particularly interesting for younger pupils, who will use it as a practical accessory protecting eyes from sunlight. To make a bee visor

you need yellow, black and white paper, glue, scissors, black marker and elastic cord. Older students can use pattern to cut the visors from the yellow paper themselves, you can cut the shape for the younger ones. Next, cut two approximately 2 cm wide stripes, which will be glued on the yellow visor. Pupils will draw eyes on white paper and glue them

on the stripy bee visor. Students can use their imagination to decorate their, add mouth with tongue or make antennas. Students just need to make holes on the longer sides, attach an elastic cord and the bee visor is finished.



Out of paper you can also make simple bee themed postcards. This task is also very simple and can be done by kids of all ages. To make a postcard you will need a hard paper, scissors / cutter, orange or yellow acrylic or tempera paints, brush, black markers and a bubble foil. Cut a postcard size rectangle out of hard paper. We usually made postcards size

A5, simply cutting A4 sized sheet in half. You can divide the backside of the postcard with a line in the middle to separate the writing and the address part, on the opposite side you will paint. Evenly paint the bubble foil, but be careful not to make the paint too thin. When the surface of the foil is evenly painted, cover it with the postcard and press it with your



hand so the pattern imprints well. You will get a print that looks similar to the drawing on a honeycomb. Once the paint is dry, you can draw bees. This way you'll get an effective honeycomb themed postcard with bees and you can explain the students the life in the beehive and the origin of honey.



Attractive products for children are also candles made of bee wax foundation. You can buy already coloured bee wax foundation in beekeeping supplies, creative supplies shops, or on the websites of internet shops with a similar assortment. Bee wax foundations are thin sheets of beeswax. They help bees to build honeycombs faster; it is placed inside the wooden frames by beekeeper, to save bees energy needed to build honeycombs. That way bee can faster gather nectar, pollen and queen bee has a place to lay eggs. Besides that, beautiful and nice smelling candles can be fastly made out of them. To make a candle you will need only a cutting board, a knife, a wick/a twine and bee wax foundation, eventually cookie cutters. Place the wax foundation on the cutting board and cut a rectangle or triangle of any size - the size will determine final size of the candle. You can cut the bee wax foundation for younger students in advance. If you work in room with lower temperature, bee wax foundation can become very fragile and break, therefore better heat them up a little before work using hairdryer.

Press the wick into wax foundation approximately one centimetre from its upper edge. When the wick holds well, wrap it inside the wax foundation so it's completely hidden. Then you can start rolling, but be careful to roll in line with the underside of the candle, otherwise it won't stand up straight. Press the edges of the candle and it is finished. Pupils are free to decorate the candle using their imagination, for example pressing different coloured balls out of wax foundation leftovers onto the candle. From contrast-

ing coloured wax foundations students can cut different shapes using cookie cutters and press them onto the body candle too. While working on candles you can tell students about bee products such as beeswax, honey, propolis and bee venom. Candle making is really enjoyable for both children and adults and it is very simple. Smaller children, who don't have motoric skills developed enough yet, require more patient and personal approach.



Other subjects

honey bee is an obligatory curriculum of nature science classes, but can be also a topic of other classes. Students can in playful and creative way adopt knowledge about honey bee also on art classes, technical classes, music classes, or grammar classes and gardening classes. (34) In the elementary school in Poltár (Nová základná škola) with which we actively cooperate on realisation of beekeeping class, thanks to the initiative of teacher, many other teachers joined bee themed project, not only form nature sciences and free-time courses.





The first grade teacher came up with various activities. Students first formed words from syllables on the interactive whiteboard, then glued pictures into bee themed sudoku and finally made paper bees. On technical classes students under supervision produced wooden hives and houses for solitary bees, which they dwelt in school area. On the arts class they organized competition for the best beehive idea. Student Parliament then voted on the best motif. The winning design was painted on the beehives. On the gardening class with students is possible to plant a flowerbed of blooming plants and bushes, or trees that will provide

food for bees and other pollinators. The topic of bees and their importance is applicable also on music class - a volunteer from our partner organisation Bybi in Norway composed an opera about bees, which was also her semestral project on music conservatory.



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