

BUDDING  
BOTANIST



**KLORANE**  
BOTANICAL  
FOUNDATION

SCHOOL BOTANY KIT

Teacher's Guide



**KLORANE**  
BOTANICAL  
FOUNDATION

CORPORATE FOUNDATION FOR THE PROTECTION  
AND THE PROMOTION OF PLANT HERITAGE



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## Who are we?

For over 25 years now, Klorane Botanical Foundation has been sowing the seeds of passion for botany.

Klorane Botanical Foundation is a corporate foundation from Pierre Fabre Laboratories, which works hard to protect and promote plant heritage. Our creation in 1994 reflected the desire of our founder, Pierre Fabre, to make a strong commitment to preserving natural species and allowing as many people as possible to share knowledge and expertise in the field of botany.

The foundation's commitment to promoting botanical heritage is rooted in three concrete missions: PROTECTING threatened plants, EXPLORING botanical treasures to increase knowledge and help protect them, and SHARING a love for botany with as many people as possible, and with children in particular.

We operate in France and around the world in partnership with conservatories, botanical gardens and international scientific institutions. Teachers, students and local NGOs all play an invaluable role in raising awareness among the general public of the importance of plants in our lives.

## Some examples of Klorane Botanical Foundation's long-term commitments:

- **The Budding Botanist programme**, first launched back in 1994, which educates some 20,000 pupils every year in France alone.
- **The Botany for Change Award**, getting students involved in re-greening their towns and cities (creating a new and sustainable 'urban garden of tomorrow' every year).
- **The Great Green Wall**, planting 10,000 desert date trees per year in Senegal to combat desertification in the Sahel region (100,000 trees planted since 2012, in partnership with the French National Centre for Scientific Research).
- **UNESCO Green Citizens**, supporting citizen initiatives that can be duplicated to save the planet (founding partner of the programme, alongside UNESCO).

The Foundation's team operates out of Lavour, in the Tarn region of France, which was also the hometown of our founder Pierre Fabre.



## Why use this kit in schools?

Klorane Botanical Foundation has worked with primary school teachers since day one, providing them with a range of teaching resources on the subject of botany.

Because biodiversity is increasingly threatened and future generations are the key to trying to reverse or slow the trend, the Budding Botanist kit has been redesigned for 2021 to offer:

- A more global overview of the plant world (its richness, its intelligence, its connections with life on Earth more generally, threats to biodiversity, different ways of preserving it, etc.);
- More group debates, along with fun and practical activities;
- Alignment with school programmes.

Learning objectives have been designed for pupils aged 9 to 11.

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## Introduction

This collection of activities contributes to educating pupils about sustainable development and forms a complementary tool to school-based learning. Organised mainly around discussions, debates and sharing information, it has been designed to help pupils question the world around them and the complexity of relationships between us and our environments.

In this guide, you'll find a range of tips on using the various teaching aids and putting together blocks of learning.

The primary objective of the teaching aids brought together within this kit is to lay the foundations for a general reflection on plant biodiversity – what characterises biodiversity and how it works – in order to better understand, as a second objective, the reasons behind its erosion. The goal is to help facilitate active research and discussion sessions among pupils. France's Department of Education recommends pupils are encouraged to start asking questions about the world around them and are taught how to use their words so that knowledge can be built collectively. The activities should help pupils develop critical thinking skills, giving them the ability to seek criteria to validate their judgements or statements, and to compare these judgements with those of others in discussions and related debates. These debates will help pupils understand each other's points of view, allowing different ideas to be expressed, while taking stock of knowledge and approximations.

All the teaching aids in this kit have been designed so that pupils can defend, share and discuss their own points of view, but also discover and add new sources of information.

The role of the adult in the room is simply to ensure the rules of discussion are respected: everyone shares speaking time and listens to others.

Their role is as much about pinning down any gaps in logic as it is about pushing deliberations along to keep discussions moving, and to supplement activities by introducing documents that will help move debates forward.



## Educational focuses and preconceptions

Based on the assumption that knowledge and curiosity are the best tools for inspiring the committed eco-citizens of the future, with the desire to protect and the will to change behaviours, every teaching aid has been designed to enchant pupils on the magical nature of the plant world and make them think about the links we all share with it.

Beyond providing basic knowledge, the main purpose of this teaching kit is to make every pupil think about the solutions that need to be put in place, the actions already taking place around them, as well as the links they have with the living world. Do they know anything about the living world? Are they interested in it? Do they respect it? If so, how do they respect it? If not, why not?

The purpose is to make pupils realise that they're part of a bigger whole, that the functioning of our ecosystems can provide solutions to climate change, that they have to develop a sense of responsibility towards the planet.

Indeed, either we humans continue to see the living world as a resource we draw upon without really thinking about tomorrow, or alternatively we believe that our planet has the same rights we do.



## Crossovers with the curriculum

In general, all the teaching aids provided in this awareness-raising kit have been designed to allow pupils to work in collaborative groups and complete projects.

The goal is to familiarise pupils with various documentary sources, teach them to seek out and compare different pieces of information, and help them form their own judgements.

The running theme of protecting plant diversity will help them reflect on the value of commitment and initiative that can be found in carrying out practical projects, such as sowing bee-friendly flower seeds.

### • Science

- Follow scientific approaches
- Carry out observations, keep written records and produce reports using precise vocabulary
- Extract the relevant information from a document
- Correlate acquired knowledge with environmental issues
- Implement responsible and civic actions, whether individually or collectively
- Discuss the living world, its diversity and the functions that characterise it
- Describe how living things grow and become able to reproduce
- Identify the exchanges between living things and their environments
- Identify environmental challenges
- Describe the interactions between living organisms themselves and their environments
- Talk about ecosystems and the consequences of physical or biological factors
- Identify types of interactions between living things and their importance in populating environments
- Identify some human impacts on the environment

### • Language

- Take part in discussions in various situations and adopt a critical attitude in relation to issues raised
- Take into account what various speakers say in debates and identify the different points of view expressed
- Present an idea
- Employ argumentative strategies
- Know how to distance personal experiences and mobilise knowledge

### • Moral and civic teaching

- Build a civic culture organised around four key areas: sensitivity, rules and laws, judgement, and commitment
- Be able to express what you feel and what others feel
- Develop a culture of discernment, understand challenges, develop a critical mind, learn to inform yourself in an illuminating way
- Commitment promotes collective action, accountability and initiative
- Become aware of individual responsibilities
- Distinguish personal interests from collective interests
- Exercise the ability to make responsible choices

## Step-by-step: teaching sessions

Activities have all been designed in a modular fashion. It's up to individual teachers, depending on their term teaching plans and the level of interest shown by pupils, to decide how much time they want to allocate to each topic.

Activities can be used for standalone sessions. Even where logical links exist between aids, they can lend themselves to individual sessions.

Most activities are structured around periods of listening and discussion among pupils. The purpose here isn't about guiding pupils towards – or even providing – the 'right answer', but rather identifying the words that come up most often, any notions that seem confused or where more information might be needed. The discussions are also an opportunity to come back to various concepts that have been discussed within other teaching aids.

Please note, the seed sowing in activity 9 should only take place in spring or autumn.

## DEBATE TIME

## LEARNING OBJECTIVES AND SKILLS

- ✿ Take stock of knowledge and personal considerations about the plant world
- ✿ Evoke the relationships we all share with the plant world
- ✿ Take what other speakers say in a debate into account and identify the different points of view expressed
- ✿ Present an idea
- ✿ Employ argumentative strategies
- ✿ Offer an analysis of practical situations
- ✿ Consider other people's points of view
- ✿ Qualify points of view while considering those of others
- ✿ Know how to identify points of agreement and disagreement
- ✿ Exercise judgement and develop a critical mind
- ✿ Take part in discussions, debates, speak in front of others, formulate and learn to justify points of view

## Notes

This poster can be used as an introduction or class activity, when pupils have already started to reflect on the world and the place of plant life within it.

- It's particularly important to note the words used during discussions, and to leave discussions as open as possible, not committing to one idea more than others, so everyone can evoke the significant links that bind us to the plant world.

- A valuable tool for debating ideas, this poster will achieve its goal when it allows everyone to find arguments to clarify their thinking and listen to other people's points of view to feed their own reflections and move the debate on.

- **The illustrations and questions aren't related to one another.** Meaning the questions aren't specifically illustrated, and vice versa. The poster contains a number of questions and illustrations designed to engage pupils in spontaneous discussion. Obviously, you can use the poster on a number of different occasions. As with any debate, it's not about arriving at an answer that will bring the discussion neatly to a close. Discovering a diversity of interpretations is a goal in itself.

## Step-by-step session

- ✿ Without using the poster, start the activity with some group discussion around the following questions: which words come to mind when you say the word 'nature'?

- ✿ What does nature mean to you? What images spring to mind? Can you describe what nature means to you? What place do humans have in nature? What place do animals have in nature? What images come to mind when you say the word 'plants', or 'vegetation'? Do you know any plants? Which ones? What positive images come to mind when thinking about the plant world? What less positive images come to mind? Throughout the discussion, make sure every suggestion is justified or explained by examples.

- ✿ Make a note of all the different words and ideas that come up to keep a record of this initial exploration of the topic so that, by the end of all the activities using all the other teaching aids in the kit, you'll be able to measure the progress of their perceptions, vocabulary and knowledge.

- ✿ Depending on the level of interest shown by pupils, it can be fun for them to try to classify the words written down, including those that express emotion, places, images, practices, the idea of hierarchies or the feeling of superiority...



Poster

- ✿ **Display the poster** and allow some quiet time for pupils to observe the illustrations and questions. Explain that the illustrations aren't linked to the questions.

- ✿ Interrupt observations with at least some discussion time so everyone has the chance to explain anything they might be having trouble understanding or interpreting.

- ✿ Next, encourage debate by asking the following questions: why have all these illustrations been put together? What do they have in common? Which illustrations are harder to understand? Which illustrations affect you the most or give you the biggest reaction?

- ✿ Arrange some group discussions so everyone can comment on the illustrations they like the most and explain the reasons for their choice.

- ✿ Do the same for the questions. The goal is about expressing points of view and for everyone to listen to the arguments put forward by others.

- ✿ Suggest groups try to come up with a title for the poster together.

- ✿ Recall the fundamental role plants have played in building the Earth's atmosphere and developing life on Earth.

## TO GO EVEN FURTHER

- ✿ Extend discussions by making two 'mood boards' from pictures cut out of magazines: one to illustrate everything that makes pupils think of the plant world, and another for everything that's the opposite of the plant world. Comment on choices and outcomes.

- ✿ Investigate whether all humans have the same relationship with nature, or if our relationship changes depending on where we live and the education we've received.



02

# SO MUCH DIVERSITY

## LEARNING OBJECTIVES AND SKILLS

- ✿ Discover plant biodiversity
- ✿ Express your own feelings and those of others
- ✿ Explore the link between understanding and respecting
- ✿ Introduce specific botanical vocabulary to describe and compare
- ✿ Raise awareness of how plants have evolved to adapt to living conditions in different environments
- ✿ Follow investigative approaches: learn how to observe and ask questions

## Notes

The purpose of this session is to let pupils see, be amazed by and develop their curiosity for the plant world, whether that's the one around them or on the other side of the world. The assumption here is that by making them curious, giving them time to observe and share anecdotes, they'll develop a respect for the living world.

- The examples grouped together on the cards, not forgetting the small common plants easily found alongside the pavement, are designed to widen pupils' horizons as much as possible, underlining the diversity of expression within the plant world.

- **The sheets should be cut up before the session.** This activity will benefit from being carried out in smaller groups initially, so everyone has the chance to see, read, observe, compare, reflect and experience.
- Underneath each photo, next to the common name of the plant, is a globe with one or more red dots. The dots indicate the region of the plant's origin, and not necessarily the region where it can be found today.

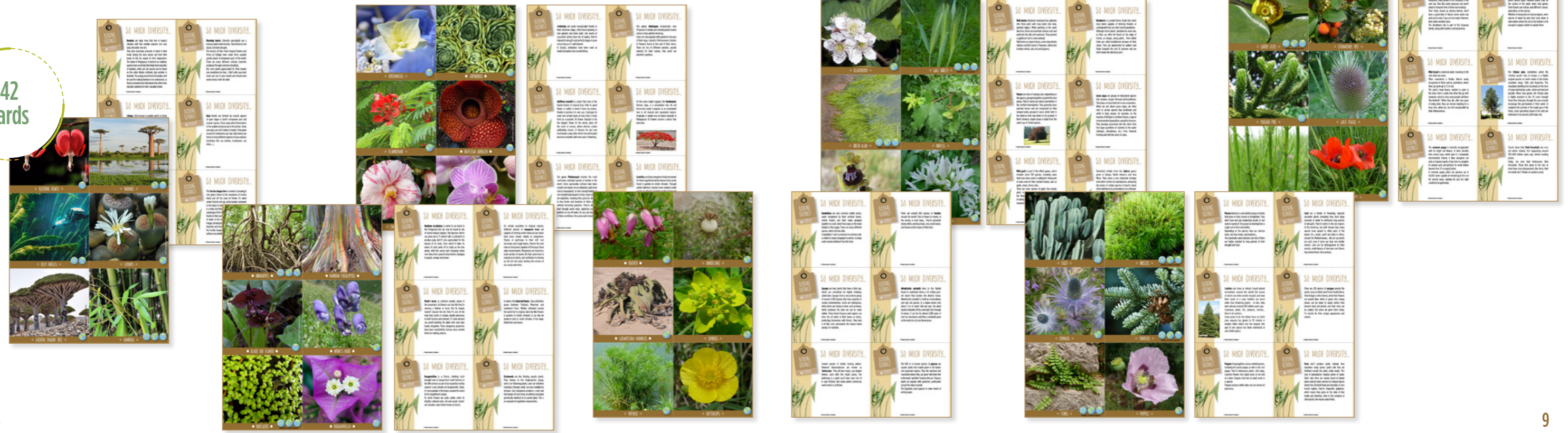
## Step-by-step session

- ✿ After distributing the cards among the groups, leave enough time for pupils to observe, read and absorb the information. Make the most of any spontaneous reactions or exclamations... always justifying them, of course! Arrange some group discussions, where each pupil can present their favourite plant, the one they find most surprising, most disturbing, the ones they know or have seen before... making sure they explain the reasons for their choices in each case. This activity is sure to lead to anecdotes and connections with personal experiences, books or documentaries.
- ✿ When all the groups have gone through all the sheets (at least the photo side), display them all before trying to classify them as a group: trees, flowers, small, big, aquatic... and observe the differences between species more closely: the colours of the bark or the petals, the shape of the leaves, the number and shape of the petals...
- ✿ Make as many classifications as possible, where the goal is to constantly notice and review them to create a feeling of familiarity.
- ✿ Draw attention to the information on the globes to help make connections between regions and geographic zones.

## TO GO EVEN FURTHER

- ✿ Extend the activity by adding to this collection of plants with photos of ones taken from your surrounding environment, whether in gardens, parks, balconies, or surrounding outdoor spaces.
- ✿ Go further by reading the 'how to name plants accurately' poster. Indeed, pupils usually enjoy exploring the Latin names written in italics on some of the texts on the backs of the cards: their binomial classification.

42 cards





# 3 HOW TO NAME PLANTS ACCURATELY

## LEARNING OBJECTIVES AND SKILLS

- Follow investigative approaches: learn how to observe and ask questions
- Use scientific vocabulary
- Deal with the notion of common characteristics
- Interpret similarities and differences in terms of related species
- Discover binomial classification
- Differentiate between genus and species

## Notes

To extend work on this poster, also provide garden centre catalogues or online research.

**A word on specific vocabulary:**  
Plants are classified into orders (words ending in ...ALES), families (words ending in ...ACEAE), genera and species. Then come the different varieties.

To name a plant, we only need the genus and species, and we sometimes add the specific variety. For example, 'parsley' belongs to the Apiaceae (Umbelliferae) family, the *Petroselinum* genus, the *crispum* species and the *tuberosum* variety.

A species is a group of individuals that share common characteristics and are able to reproduce among themselves.

Since Linnaeus in the 18<sup>th</sup> century, every species has been designated by two Latin or Latinized words: the name of the genus the species belongs to, followed by a term that characterises it (its Latinized common name, its country, its region of origin, the name of the person who first discovered it...). This is known as binomial classification. It helps everyone understand what you're talking about, wherever you are in the world. Both names are written in italics. The first takes a capital letter, but not the second.

## Step-by-step session

- Specifically review the following sheets from activity 2: *Lamprocapnos spectabilis*, *Aconitum napellus*, *Tacca chantrieri*, *Hydrangea*, *Rafflesia arnoldii*, *Delonix regia*, *Phalaenopsis*, *Camellia*, *Erica arborea*, *Cyperus papyrus*, *Ranunculus*, *Hordeum murinum*, *Acer*, *Allium ursinum*, *Ophrys*.
- Distribute them in groups and focus specifically on the texts: ask pupils to research the following questions: what are all the names found on the cards? Why are some names in Latin? Why are some names made up of two words? What do we mean by 'genus'? Why do we get indications of quantity when we talk about the number of 'species'?
- Allow ideas and knowledge to emerge before formalising any definitions and potentially structuring suggestions with a tree structure.
- Introduce the 'how to name plants accurately' poster.** Leave enough time to observe the five visuals taken from the botanical cards. Look for common characteristics: guide pupils towards the shape of the leaves, the number of 'points' or palms, the fruit or samara, the number of big 'veins'... Point out the differences.
- Look at the names under each one. Identify what's common and what's specific. Explain common characteristics demonstrate the genus and specific characteristics demonstrate the species. Create a small tree structure, or revisit the one you made previously, to clearly identify the genus and species.

**Une affiche**

**HOW TO NAME PLANTS ACCURATELY**  
**COMMON NAMES AND SCIENTIFIC NAMES**

**Why are plants' scientific names written in Latin?**  
Because ever since the early Middle Ages, Latin has been the language of scholars and religious texts in much of Europe.

Every human society has its own words to refer to plants found in its environment. These are the names used locally, called **common names**. They mean there are lots of regional names, and the same plant can sometimes have more than 10 different names in the same country.

When European scholars first began to study the living world around them, they needed to have a common vocabulary to identify all known animal and plant species, to make communication easier and avoid misunderstandings.

18<sup>th</sup> century Swedish naturalist Carl Linnaeus famously studied, named, and classified around 6,000 plants. He was one of the leading adopters of **binomial nomenclature**, the universal system for naming all living things. This involves a Latin **scientific name** made up of a genus name and a species name given to every living organism, traditionally written in italics. Binomial nomenclature, which is still used to this day, benefits from being universal so it can be shared by everyone. It means no one can name every species accurately.

**EXAMPLE: MAPLES**  
Maples are grouped together under the *Acer* genus. Together, they make up a group of trees of around 150 related species.

**Some common names for the field maple**  
Field maples can also be called the **common maple** or **hedge maple**, depending on where you are in the world.

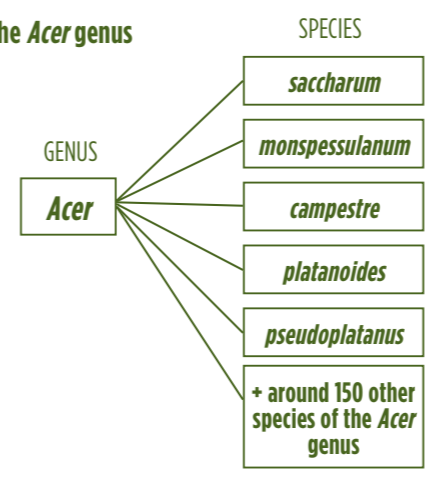
**Scientific name for the field maple**  
It is made up of two names: the genus name for maples: *Acer* and the species name for this particular maple: *campestre*.

**Acer saccharum** (Sugar maple)  
**Acer monspessulanum** (Montpellier maple)  
**Acer campestre** (Field maple)  
**Acer platanoides** (Norway maple)  
**Acer pseudoplatanus** (Sycamore maple)

Maples share visible characteristics, such as winged fruits grouped in pairs (known as samaras), and palmate leaves in most species.

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## Example: the *Acer* genus



## TO GO EVEN FURTHER

- Extend the activity with the photos from activity 2. Look up their common and scientific names. If you've already begun sowing the seeds from activity 9, do the same for the 4 seed varieties provided in the kit (examples of names for cornflower include bachelor's buttons, blue sailors, witches' bells...).

- After reading the texts, do some research to find other species names from the *Acer* genus. Check to see if the two main characteristics are found in every case.
- Go back to the sheets from activity 2 and create new tree structures for the following genera: *Allium*, *Ophrys*, *Camellia*, *Phalaenopsis*, *Hydrangea*.



04

# UNDERSTANDING ECOSYSTEMS

## LEARNING OBJECTIVES AND SKILLS

- ✿ Discover the concept of ecosystems and how they work
- ✿ Understand the importance of biodiversity within ecosystems
- ✿ Address the diversity of relationships between living things in their environment
- ✿ Introduce the idea of balance and imbalance within ecosystems
- ✿ Use acquired knowledge to understand issues related to the environment and sustainable development
- ✿ Follow investigative approaches: learn how to observe and ask questions.

### Notes

- This entire activity is organised around two teaching aids: the 'Examples of interactions within ecosystems' poster and the 'Ecosystems of all sizes' MiniMag.
- It's absolutely vital you begin by introducing the concept of ecosystems using the MiniMag before complementing it with information from the 'examples of interactions within ecosystems' poster.

#### A word on concepts:

An ecosystem is a dynamic whole formed by living things (biodiversity) that interact with one another (biocenosis) and their living environment: the climate, temperature, soil, light (the biotope). The size of an ecosystem can vary massively: from the very small (a dead tree, a water hole at low tide) to the ginormous (an entire ocean, the Arctic, a desert...).

Ecosystems are specific environments that have a particular set of physical and chemical characteristics. Every biotope brings together a group of living things. Some are very big while others are minuscule, even

microscopic, such as bacteria, but all relate to each other (biocenosis). When a biocenosis evolves over time within a biotope, meaning communities of species living alongside one another and interacting in harmony with their physical environment, we call it an ecosystem. An ecosystem therefore represents a certain stability, although that doesn't mean it's not capable of being dynamic or evolving. That's because, within ecosystems, different living things interact with each other all the time, so when one species disappears, the others are at risk of disappearing too. This point should be emphasised strongly during discussions.

- The central goal of this activity is to help pupils understand that every environment, however big or small it might be, contains an amount of living things that, thanks to the sum of the relationships that bring them together, form a natural balance. If any disturbances wipe out any of these organisms, then that balance as a whole will be disturbed, in the form of a chain reaction.

## Step-by-step session

### A. Using the MiniMag 'Ecosystems of all sizes'

✿ After handing out the material, immediately arrange an initial group discussion, without reading the texts beforehand, based solely on the visual representations of the natural environments. Ask the following questions: do you think these are the same natural environments? Would you find the same things living there? Are the living conditions identical? Which elements might vary from one living environment to the other?

✿ Dig deeper into one example of your choice and find some plant and animal species related to that environment. Discuss what's surprising about the examples – would you have imagined so many living creatures could co-exist? Consider the benefits of this cohabitation.

✿ Once the idea of diversity linked to a specific environment has taken hold, begin reading the texts.

- ✿ Go back over the concept of ecosystems together, try to arrive at a group definition, identifying any key words (all the living creatures, balance, inter-dependence), as well as any ecosystems close to school, thinking about what can protect ecosystems and, on the other hand, what can upset them.
- ✿ Throughout discussions, emphasise that it's not about nature on one side and humans on the other: we're part of nature, and we couldn't live without it. We're all stakeholders in the ecosystems we live in.



### B. Using the poster 'Examples of interactions within ecosystems'

✿ After reading all the information in the MiniMag, arrange a group discussion before presenting the poster. Ask for examples of all the interactions we can imagine within an ecosystem. Allow spontaneous ideas to be expressed and potentially stimulate proceedings by asking: how do the plants sow their seeds? Do the animals play a role? Thinking of a specific place, what happens there from morning to night? Thinking about what plants need to live, what interactions might be taking place?



## TO GO EVEN FURTHER

✿ Extend reading and discussion activities with an excursion to discover some local environments. Outline an observation perimeter for each group (the woods, a corner of the grass, an embankment, a ditch, a garden...), make a note of the living conditions (sunshine, orientation, humidity...) and establish some species counts. Interactive science modules, commonly offered by a number of local associations, can also help extend learning.

✿ Present the poster and, after reading the various paragraphs, compare with what was expressed spontaneously, then comment on the new information.

✿ Reflect on the poster's introductory text to get back to the notion of balance vs. imbalance within an ecosystem: what happens if we don't leave dead trees alone in the forest? What would happen to Lathraea if the tree it's climbing were cut down? What happens if an anthill is destroyed?

✿ These discussions get to the heart of this activity: helping pupils understand that an ecosystem is the sum of interactions and the sum of all the species. If one or more are wiped out, inevitably, the whole balance will be upset, which can put all the species linked to that particular ecosystem in danger.



# MEET TWO REAL-LIFE BOTANISTS

## LEARNING OBJECTIVES AND SKILLS

- Discover what a career in botany involves
- Explore individual links with the plant world
- Understand what respect for the plant world really looks like

## Step-by-step session

- Allow enough time for individual reading before starting with the questions and debates.
- Provide regular breaks during reading sessions to address any difficulties encountered.
- Arrange some group discussions to explore the information found in the magazine: what was surprising? What does it mean to have a career as a botanist? How do botanists help the world? What's the point of botany? For how long has the career existed? What's their priority? Why do they talk about respect? Why do they believe plants are essential to human survival? What words are used to talk about biodiversity erosion? How can this erosion be explained as a loss for humanity? How might we sum up the two botanists' priorities?

- All these discussions should help representations naturally emerge, alongside everyone's own points of view.
- Reading work can be extended using the poster from activity 1, 'debate time', and, more specifically, with the following two questions: do plants have to be useful to be respected or protected? What place do plants have in your life?
- Pupils should be allowed to review their answers from this activity, supplementing them in light of more recent discussions and comparing them with the discussions that just took place. They might also consider what answers the botanists themselves might have given.

## TO GO EVEN FURTHER

This activity can be extended by creating a survey as a group that pupils can take home to their families, helping to investigate the way we see plants in more detail.



**BIODIVERSITY LOSS**

“When I worked in Sabah in northern Borneo 25 years ago, 80% of the forest was covered by original rainforest. Today less than 2% of that forest remains. It's not just rainforests and plants that have disappeared over time, but also the animals and tribes that once lived there, along with all their knowledge. We're all directly responsible to some degree for this destruction because of the way we live our lives. Before, we had ecosystems that worked well, but today they've been completely eroded. The number one cause of biodiversity loss is deforestation. It's the disappearance of ecosystems. In Sabah, for example, 400,000 hectares are lost every 8 years. That's the size of the county, like Savoie. We anticipate... the land is no longer what it once was. It's a place, so we shouldn't be surprised that biodiversity is dropping. Preserving vegetation is the best of all ways to protect ecosystems, birds... all ways in and a better equipped.”

**LET'S MAKE A DIFFERENCE!**

“Plants are the basis of life on our planet. From oxygen production to a range of ecosystem services, so we have to preserve them. Plants reduce heatwaves, especially in cities, by lowering temperatures. The pursuit of life on Earth depends on the plant world. And being interested in that world is also about becoming aware of its condition, and its fragility.”

**EVERYONE NEEDS TO PLAY THEIR PART**

“Everyone needs to play their part in increasing the number of native plants in their back area as this will help understand what's around us. It's also important to accept the idea that we need to allow wilderness to grow.”

**IN CONCLUSION**

“Nature is amazing. The solution to continuing life on Earth comes from that observation. Being around it is very important. Being interested in this world is about understanding that plant life is fragile, even though it's the foundation of life on Earth.”

**WHY DID YOU BECOME A BOTANIST?**

Delina Florio: “I've always been a plant lover. I've always been drawn to the different ways we can use them, whether that's in food, medicine... I studied plant biology and specialised in plants because I wanted to understand all the things plants are capable of producing. They're absolutely incredible for medical and cosmetic purposes. For me, you have to see plants in their natural environment. And you never really stop discovering - we're finding out new things all the time. A plant is a bit like a factory that's able to produce everything needed for an ecosystem to survive. When you're interested in plants, the first part is that you're never stopped discovering. We have to understand and protect ecosystems. Plants produce everything in certain environments that they simply don't produce elsewhere, because absolutely everything depends on their environment. They often produce things according to the defences they need to put up. Plants suffer less than you might think - they can adapt, camouflage themselves, poison animals, and they even know how to stop other plants from growing... it's really the survival of the fittest.”

Bruno David: “I've always been a plant lover. I've always been drawn to the diversity of the plant world. I would watch everything around me. Plants inspire me. Almost like... but they were always a little bit similar to humans for me. Plants have a mysterious side to them. I was convinced there were significant resources to be found in plants. Because they can't move, they've developed a whole host of strategies to survive. Plants are full of incredible mechanisms capable of interacting with other things to defend themselves against predators, which makes them very interesting. I decided to focus my studies on understanding how they work. I studied phytochemistry, chemistry and, all throughout my career, I've worked with plants from a therapeutic point of view. It's not just humans who use plants for their health. For example, many people in Brazil use plants to increase and decrease their fertility. There are considerable powers in a botanical and phytochemical. It's never too late to start. I've always been following my passion.”

**OUR INTEREST IN PLANTS**

Many interested in plants, particularly in plants with practical uses like food, medicine, and in soil, is a very old practice indeed.

**WHAT EXACTLY IS BOTANY?**

“Botany is the science of understanding plants. Human beings have always used plants, especially for food. Ever since ancient times, people have needed to classify them, name them, describe their characteristics... Thanks to Linnaeus, the nomenclature is now unambiguous, which means everyone can talk about the same plant. Otherwise, only having their common names in lots of different languages would cause great confusion.”

**WONDERFUL MEMORIES**

Delina Florio: “My best botanical memories are about getting to the heart of a plant, the microscopic details, cell structures, their capacity of producing oxygen - it's so impressive. It's the science of plants that has always fascinated me and that continues to fascinate me every day.”

Bruno David: “I was lucky enough to try my hand at prospecting in Cambodia, which had lost all its medicinal and botanical resources during the dark days of the Khmer Rouge (1975-1979). It was so exciting to be part of the rebirth of all that knowledge, especially at the Faculty of Pharmacy in Cambodia, in a country that still uses many plants for medicines, botany and identifying plants represent the key foundation for controlling phytochemicals and therapies. As such, we had to redouble our back ground work for future Cambodian pharmacists to appropriate this vital botanical knowledge.”



# 6 THE GAME TO SPIKE CURIOSITY



## LEARNING OBJECTIVES AND SKILLS

- Amaze pupils by changing the way we look at the plant world
- Express your own feelings and those of others
- Discover the strategies plants have developed in order to survive
- Follow investigative approaches: learn how to observe and ask questions



## Notes

- Cut up the cards** before setting up the game. Six copies of the cards are provided in the kit.
  - The purpose of the game is to find 'families' or groups.
- The information on each card should be used afterwards during group discussions.

## Step-by-step session

- Introduce the game by explaining the purpose is to find families. Introduce the five families in the game:
  - 'Surprises guaranteed' family
  - 'Protection strategies' family
  - 'Reproduction strategies' family
  - 'Records' family
  - 'Smart plants' family
- Create groups with 3-5 players in each.
- Each player is given 5 cards at the start of the game. The rest are used as the deck turned face down so the text is hidden.
- Players must always have 5 cards in their hand.
- The youngest player starts, then play moves clockwise around the group.

- When it's their turn, each player has the choice between either drawing a card from the deck or asking another player for a card of their choice.
- If the player chooses to draw a card from the deck, they must also choose one of their cards to discard from their hand and slide it under the bottom card of the deck.
- If the player chooses to ask for a card from another player, they must say the following: "I would like a card from the '.....' family". In this case, if the other player has a card from this family, they must hand it over (if they have more than one, they can decide which) and, at the same time, draw a card from the deck so they always have 5 cards in their hand. If they can't provide a card from the requested family, they should confirm they have no card to give.
- The winner is the player who is first to have 5 cards from the same family in their hand.

- Other variants of the game can include:
  - Needing 6 or 7 cards from the same family to win.
  - Needing a card from each family in your hand to win.
- Once several games have been played, suggest using the content found on the cards. Each pupil should take all the cards from the same family. Allow enough time for reading, but with regular interruptions to answer any questions that may arise.
- Organise a group discussion so that everyone has the chance to present the anecdotes they found most unbelievable or surprising. Can you believe plants demonstrate these behaviours or strategies? Does this information change the way you see or think about the plant world? Take the following question from the poster from the first activity, 'are plants sensitive and intelligent?'
- Recall some of the answers initially given and round off the session in view of the new information pupils have just read. Observe how answers have differed and evolved.

6 decks of 40 cards



# BIODIVERSITY IN DANGER

## LEARNING OBJECTIVES AND SKILLS

- ✿ Understand the causes of biodiversity erosion
- ✿ Become aware of the consequences of human activity on biodiversity
- ✿ Evoke the concept of individual and civic responsibility in terms of the environment
- ✿ Reinvest learning on the conditions needed for maintaining good biodiversity
- ✿ Explore our specific responsibility towards endemic species
- ✿ Follow investigative approaches: learn how to observe and ask questions

## Notes

- Photocopy or, depending on the number of pupils in class, keep an uncut copy of the game to one side to allow for correction and displaying at the end of the game to go over the key messages. Otherwise, you could also project the PDF version of the reassembled puzzle, which can be downloaded from the Foundation's website.
- Cut up the 6 A4 sheets, which are provided in six copies in the kit, before setting up the game. Be sure to mix the pieces well before starting the game.
- This activity is a puzzle. The information it contains should then be used as a second stage.
- The plants around the edge of the puzzle have been chosen from those on the red list of vascular flora species found in mainland France (all flowering plants, ferns and conifers. Mosses and algae are not included), as drawn up by the IUCN (International Union for Conservation of Nature). This national red list helps determine the level of risk faced by plants and animals that reproduce in a certain region, or that are regularly found there, against disappearing from their natural environments. This list is a vital tool for identifying priorities and action strategies to encourage all stakeholders to act to limit the rate of species disappearance. To find out more, go to [www.iucn.org](http://www.iucn.org).
- In 2018, out of 4,982 indigenous plant species recorded in the region, 742 were threatened to varying degrees, that's 15% in total. The assessment was carried out in partnership with the French Federation of Botanical Conservatories and France's Natural History Museum in Paris, which was consolidated by the French Biodiversity Agency. Across the world, the level of knowledge about our flora is highly heterogeneous, but experience shows that, in general, 20% of species of each country's national flora are threatened to varying degrees. Studying the numbers can shock pupils, but they will gain a better understanding of what we mean by biodiversity erosion as a result.

## Step-by-step session

✿ Introduce the game, without showing the materials, explaining it's a puzzle they need to solve that will help us explore the main threats to plant biodiversity. Add that the plants shown around the edge of the puzzle are examples of plants typically threatened in France.

✿ Before distributing the materials, arrange a short group discussion to answer the following question: what are the threats facing plant biodiversity? Note down what pupils come up with so you can compare afterwards with the information they discover during the game.

✿ Once the puzzle is complete, give each group enough time to read the information. Arrange a group debate based on the following questions: what is threatening wild flora? What threats seem most serious and why? Can we classify these threats from most serious to least? What simple changes could we make in terms of human behaviour? What might be harder to change?

✿ Make sure you cover the following facts:

- Biodiversity contributes to the safety, health and well-being of the human species, among other things.
- Biodiversity loss caused by humans has been faster in the past 50 years than ever before in all of human history.
- Ecosystem degradation could worsen considerably during the first half of the current century.
- The three main causes of plant species extinction are loss of natural habitats linked to changes in agricultural practices since the end of the Second World War, infrastructure development and the growth of invasive species. According to estimates from the Royal Botanical Gardens at Kew in 2016, there are over 400,000 identified plant species worldwide, the vast majority of which are flowering plants. Around 2,000 new species are discovered each year. As for animals, there are around 1.4 million identified species, including 1 million insects, not to mention estimates of unidentified species, which are thought to exceed 10 million...

## TO GO EVEN FURTHER

✿ Extend discussions with fieldwork or, where possible, with the help of local services: explore your local environment to discover what's changed over recent years, what's been built (roads, shopping centres, residential areas...), what's developed (riverbanks, forest roads...), as well as the natural spaces that have been modified or cultivated. Consider what impacts these changes may have had on the natural environment. These discussions could be further enriched by meetings with local associations working to protect the environment, or even testimonials from local people who have lived in the area for many years.





# 8 TAKING ACTION TO PROTECT BIODIVERSITY

## LEARNING OBJECTIVES AND SKILLS

- ✿ Discover examples of action taken around the world to protect biodiversity
- ✿ Consider local efforts in your area
- ✿ Reflect on the behavioural changes needed
- ✿ Follow investigative approaches: learn how to observe and ask questions

### Notes

The twelve examples provided on the fact sheets are designed to demonstrate that, wherever you look in the world, actions are bringing people together to fight for biodiversity protection. These examples could naturally be extended with research at your local Natural History Museum or with the help of environmental protection groups in your local area, alongside community-based efforts, those of families, individuals...

Look back over the work from the previous activity and, in particular, the list of main threats to biodiversity, which will help pupils discover which threats could be reduced through each action. Expected responses include:

- Over-exploiting forests vs letting their natural cycles take place through re-wilding.
- Introduction of invasive species vs combating invasive plants in forests or planting wild and local species.
- Destruction of natural habitats vs green and blue grids.
- Large-scale removal or disappearance of plant species vs seed banks.
- Destruction of natural habitats and concreting over them vs urban re-greening.
- Using chemical treatments vs pesticide-free gardening.
- Destruction of natural habitats vs restoring wetlands.
- Over-exploiting forests vs planting new forests.
- Intense agricultural practices and over-exploiting forests vs agro-forestry.

Suggest carrying out some surveys to establish a list of everything families, as well as the local council and local groups, are doing to protect biodiversity: later grass mowing, insect hotels, birdhouses, wild grass strips, flower meadows, reducing lawn mowing, fallow corners...

Suggest, where possible, visiting local botanical or any other impressive gardens.

### Step-by-step session

Leave enough time to read and understand the texts, then organise group discussions around the following questions: which projects are you most interested in and why? Could any of the efforts you've read about be introduced where you live?

2 copies of 12 cards



## TO GO EVEN FURTHER

- ✿ Extend the activity by geographically pinpointing the actions from the cards on a map or globe.
- ✿ Further extend by reflecting on individual actions everyone could take using the poster you can download from the Foundation's website. To give even more weight to global efforts, small, everyday actions are important, such as reducing waste, water and energy consumption, buying locally, raising awareness among friends and family...





# 9 SOWING AND CULTIVATING BEE-FRIENDLY PLANTS

## LEARNING OBJECTIVES AND SKILLS

- ✿ Take action to protect biodiversity
- ✿ Revise the reproduction strategies of flowering plants
- ✿ Reinvest knowledge in related examples
- ✿ Follow investigative approaches: learn how to observe and ask questions
- ✿ Experiment, argue and test several potential solutions
- ✿ Express and apply results from research while using scientific vocabulary

## Notes

- Cultivating bee-friendly seeds represents the culmination of all the activities in this kit. It underlines the ease with which we can all do something to promote biodiversity and helps us review most of the learning acquired from the kit's various teaching aids, including:
  - threats to biodiversity;
  - inter-relationships within ecosystems;
  - the consequences in the event of an ecosystem's balance being disrupted;
  - the importance of the plant world for human survival...
- The four varieties of plants provided in the kit have been selected for:
  - how easy it is to sow them;
  - their flowering being spread out over several months, and before the end of the school year;
  - the range of potential observations, from the growth stages of each variety to their appeal and the preferences of pollinating insects;
  - that little extra surprise in discovering the flowers are edible!

**Some additional information:**  
 A wild bee lands on up to 5,000 flowers per day, and a honey bee around 3,000. Bee colonies depend on a steady supply of nectar and pollen. If either are missing, the bees will suffer malnutrition, putting their lives at risk. It's therefore very important their food supply is varied and high quality. However, the diversity of plants in our natural spaces is declining and, by using pesticides, we're destroying colonies of pollinating insects. Heavy losses have been reported by bee keepers who keep honey bees in beehives, but the worst affected are the wild bees.

A study published in the PNAS Journal (Proceedings of the National Academy of Sciences of the United States of America) estimated that between 1–2% of insects disappear from the planet every year. It seems the rate of insect disappearance is much higher than that of other animals. In fact, it could be 8 times higher than mammals, birds or reptiles. In 100 years, all insects could be wiped off the face of the Earth.

Once the plants are big enough, make sure to observe their interactions with pollinating insects. Do some research on pollinating insects in advance to find out how to recognise them. Here are a few questions you could put to pupils to help guide them: which insects will be attracted to which varieties? Do insects always visit plants at the same time of day? How much time do they spend on a flower? How many flowers do they visit? How long for? Differentiate between auxiliaries (lacewings, hoverflies, ladybirds...) and pollinators (bees, butterflies...).

Below is a basic observation sheet as an example.

OBSERVATION SHEET	
?	QUESTIONS
💬	HYPOTHESES
🔧	EQUIPMENT
🔍	OBSERVATIONS
📝	CONCLUSIONS

At the end of the activity, suggest pupils summarise the project on a poster to convey a message about the importance of bee-friendly plants to share with their friends, families and other classes.

## Bonus information – sowing tips

**Time of year:** Sowing in autumn guarantees all 4 plants will flower before the summer holidays (subject to proper frost protection in winter).

In areas with milder climates, you can start sowing as late as March while still ensuring they'll flower before the summer holidays. Sowing between early April and mid-May will mean flowering will take place between June and August, depending on the varieties. Nevertheless, some seeds may simply fail to germinate, or their flowers won't appear, but this is all part of the learning process.

**Containers:** Depending on your circumstances, seedlings can be germinated in small pots before being transferred to larger pots or trays outside (30–50 cm deep), or even directly in the ground in spring. The number of seeds provided is enough to cover more than 5m<sup>2</sup>. To grow a plant in a pot for its entire life cycle, ensure a minimum depth of 15–20 cm and make sure the pot is big enough for the final size of the plant (for example, marigolds are much smaller than borages).

Please note, for borage plants, you can further widen the spacing between seeds (8 cm) and rows (40 cm).

**The ground:** Ideally, use classic 'flower pot' potting soil to fill your trays or pots, with just a thin layer of seed compost on top (lightly covering the sown seeds). Where possible, avoid using compost soil, as the flies in the soil could kill off the seedlings.

**Possible alterations:** You can mix varieties in the same row or pot, but remember to label each seedling carefully to remember where each variety has been sown. While it's easy to recognise plants once they've flowered, it's much harder when only their first shoots and leaves are visible. Enough seeds are provided for each pupil to work on their own pot or tray. Children could perhaps bring their own pot or tray from home to work on.

## Step-by-step session

- ✿ Introduce the bee-friendly seed sowing project and, after reading the information on the 'sowing bee-friendly plants' poster, work as a group to come up with some benefits the project could bring to biodiversity protection efforts.
- ✿ Extend discussions by looking at the 'examples of interactions within ecosystems' poster to emphasise that when a species (pollinating insects, in this case) is vulnerable, this has consequences for all the other stakeholders in their ecosystem, in this case, flowering plants.

- ✿ Organise some group discussions to reflect on observations pupils will be making: how to note or design what's going to happen, should we set a time frame, how will we find the best conditions for seedlings (light, heat, water...).
- ✿ Observe the dry seeds and think about what will happen as the seeds grow. Establish some different germination protocols with a few seeds for each, varying the light, heat, water and soil conditions.
- ✿ Suggest drawing diagrams of what will happen as the seeds start to germinate.





Poster

DEBATE TIME

42 cards

SO MUCH DIVERSITY

Poster

HOW TO NAME PLANTS  
ACCURATELY

30 MiniMags  
+ poster

UNDERSTANDING  
ECOSYSTEMS

30 MiniMags

MEET TWO REAL-LIFE  
BOTANISTS

6 decks  
of 40 cards

THE GAME TO SPIKE  
CURIOSITY

6 copies  
of a puzzle

BIODIVERSITY  
IN DANGER

2 copies  
of 12 cards

TAKING ACTION TO  
PROTECT BIODIVERSITY

3 posters  
+ 4 seed sachets

SOWING AND CULTIVATING  
BEE-FRIENDLY PLANTS



**KLORANE**  
BOTANICAL  
FOUNDATION

CORPORATE FOUNDATION FOR THE PROTECTION  
AND THE PROMOTION OF PLANT HERITAGE