

GROWING FOOD IN THE SCHOOL GARDENS

EDUCATIONAL MATERIALS

ONE SEED FORWARD

AND

UNIVERSITY OF ABERDEEN

September 2018



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About the Materials

These materials were developed as part of a pilot project funded primarily by the Aberdeen City Council's Community Food Growing Fund over the period from September 2017 to July 2018.

The pilot project aimed to establish gardens for food growing in primary schools with a view to:

- Encourage children and teachers to learn about growing.
- Introduce discussions around fresh food and healthy eating.
- Promote community engagement in food growing initiatives.
- Develop educational materials linked to curricular areas using the school garden as a focus for learning and well-being.

The activities presented here were developed alongside the growth of the gardens in the pilot schools. The activities involved children and teachers learning about all stages of growth and development of the gardens from planting to harvesting and cooking.

How to use the materials

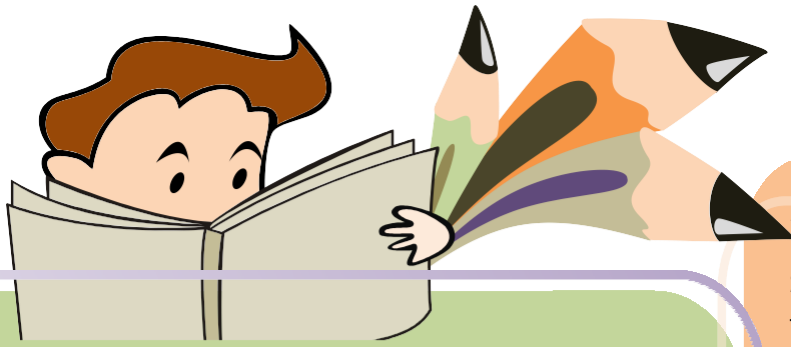
The materials have been written as teacher guides and are not meant to be used directly by pupils. They offer a guided sequence of cross-curricular suggestions for developing a coherent programme of learning throughout the school year, linked to the differing stages of the garden development. There are nine key sections labelled A to M, each of which is linked to a distinct period of time in the garden year:

- A. From School Grounds... to School Gardens.
- B. Designing and Constructing a garden.
- C. Measuring and Estimating.
- D. The mystery of growth.
- E. What can you grow... in Scotland?
- F. The secrets of the soil.
- G. When the soil is at rest...
- H. Crazy Compost.
- I. From Small to Big: Seeds and Germination.
- J. From Planting to Growing.
- K. Tending to the Gardens.
- L. Harvesting.
- M. From Harvesting to Cooking.

The Calendar

A garden calendar is provided in the appendix for teachers to record events and plan ahead. The calendar also includes key knowledge and skills underpinning the different phases of the learning process. Teachers can use the list of attributes to evidence learning and integrate with other suitable classroom activities to meet children's different learning needs.

- * All the activities presented have been tested with children and all photographs are original and used with permission.



A/B/C. From school grounds ... To school gardens

School grounds: an empty space?

School grounds are a space used by different people for different purposes: car park; playpark; sport and recreation areas; wild spaces; storage etc. Decisions on how to use the grounds are made on the basis of size and location of the school; for example, some schools may deploy a larger area to play if the school is located in the centre of a city, or to a car park, if the school is more peripheral.

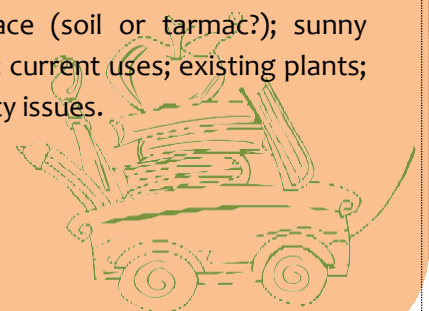
1. **Uses and Purposes of school grounds.** We want to find out how the grounds are currently used and by whom; how much space there is for growing food in the school grounds; and what might be the best location for a food garden.

Activity 1a: in class, the teacher can lead a **group discussion** with the children about school grounds. A simple questionnaire or a drawing may be used to first find out from children how they like their school grounds; their preferred activities and what they would like to change, keep or what features they would like to add more of.

Activity 1b: discussion about school grounds may be narrowed around a discussion about **'growing spaces'**: are there any existing gardens already? What are their sizes? What can they be used for?

2. **Survey:** children may continue their research by **'designing and doing a survey'**.

Activity 2a: In groups, children can devise a set of questions they would like to answer by going out and observing the grounds. Relevant items to look for may be: ground surface (soil or tarmac?); sunny spots vs. shaded areas; current uses; existing plants; accessibility and security issues.



Previous step: Weeding and Harvesting

By the end of this month, pupils will have:

1. Discussed the different uses and purposes of the school grounds.
2. Surveyed and mapped the school grounds;
3. Cleared the grounds of existing weeds;
4. Harvested and preserved/distributed existing produce;
5. Measured spaces for growing;
6. Made and assessed design plans for the garden.

3. **Clear the grounds.** Outside, children can look more closely at a potential space for growth. What is there on the ground? A collection of weeds, rubbish, stones may follow to support a discussion about what may be used in the garden and what we need to discard.

Activity 3a: children can help the teacher **write a request/recommendation** to the city council for the space to be cleared in order to start a food growing garden.

4. **Harvesting and preserving.** If the school has a garden already, children can harvest any remaining produce. Veggies, berries or flowers can be taken back home or used in the school for various purposes: observation and analysis; tasting, cooking or preserving (**see handout 'From Harvesting to Cooking'**).

Activity 4a: harvest any existing produce from the garden and/or pick any wild produce growing near the school and in the school grounds (e.g. Rowan berries; bramble; herbs etc.).

5. **Mapping and Measuring.** It is important to find out where a garden may be located and the space that is needed.

Activity 5a: Outside, children can map and measure the different areas of the school grounds: i. Children can map where people play or run in order to decide on the best space to use for food growing; ii. Measure how much space is occupied by plants; herbs and flowers; how much sun any area can get; how far the growing space might be from the nearest door or water tap.

Activity 5b: in class, children can review their drawings and measurements. A discussion can follow: How much space is currently used for playing or exercising? How much space is unused? How much space is occupied by plants of different sizes?



6. **Design your garden.** After considering questions about space and what children would like to see growing, in class, the teacher can guide children to design their garden.

Activity 6a. Individually and then in groups, children can draw their preferred garden, including all relevant features (paths; water access; shelter; fencing; signage; types of plants).

Activity 6b. In groups, they can discuss their plans and modify them if they wish.

Activity 6c. All plans should be submitted to the garden coordinator in the school for further discussion with the city council.

Activity 6d. The garden coordinator will visit the class and make some considerations about the different plans. In class, a discussion should follow on the feasibility of the suggestions made then a final plan drawn up and shown to pupils.



From school grounds ... To school gardens Across the Curriculum for Excellence:

Health and Wellbeing

- engages children and young people and takes account of their views and experiences, particularly where decisions are to be made that may impact on **life choices**
- uses a variety of approaches including **active, cooperative and peer learning** and effective use of technology
- encourages and capitalises on the potential to experience learning and new challenges in the **outdoor environment**
- leads to a lasting commitment in children and young people to follow a **healthy lifestyle** by participation in experiences which are **varied, relevant, realistic, and enjoyable**
- harnesses the experience and expertise of **different professions** to make specialist contributions, including developing **enterprise and employability skills**.

Numeracy and Mathematics

- develop a secure understanding of the concepts, principles and processes of mathematics and apply these in different contexts, including the world of work
- engage with more abstract mathematical concepts and develop important new kinds of thinking
- develop essential numeracy skills which will allow me to participate fully in society
- interpret numerical information appropriately and use it to draw conclusions, assess risk, and make reasoned evaluations and informed decisions
- apply skills and understanding creatively and logically to solve problems, within a variety of contexts
- make creative use of technologies to enhance the development of skills and concepts

Sciences

- develop **curiosity** and understanding of the environment and **my place in the living, material and physical world**
- develop the skills of **scientific inquiry** and investigation using **practical techniques**
- develop skills in the **accurate use of scientific language**, formulae and equations
- recognise the impact the sciences make on **my life**, the lives of others, the environment and on society
- develop an understanding of the **Earth's resources** and the need for responsible use of them
- express opinions and **make decisions** on social, moral, ethical, economic and environmental issues based upon sound understanding



D/E. The Mystery of Growth

What is growth?

1. **Growth** is not a homogenous process but there are both quantitative and qualitative aspects of 'growth'. We want to know how things grow in the garden.

Activity 1a: children may be encouraged to share their ideas of 'growth'. They may be referring to a one dimension (e.g. length), or they may use common words to talk about relative sizes (bigger; smaller than; medium).

2. **Core ideas** include **variety** of shapes and sizes for growing; **difference** amongst different types of plants and sometimes within the same group of plants; **and change** across the stages of development of each individual plant. So a plant can grow taller, wider, or in a wonky shape!

Activity 2a: children can research different types of plants on the Internet and select examples of different shapes. Children can categorize and sort the different shapes (Math and English) or discuss how the different shapes can help the different plants to survive (biology).



Activity 2b: Children may be encouraged to discuss the difference between 'veggies', 'tubers' 'herbs' and 'plants'; compare their anatomical and structural differences as well as their different uses.



Previous Step: Measuring and estimating

Previous step: From grounds to gardens

By the end of this month, pupils will have:

1. Understood the process of 'growth';
2. Researched different varieties of vegetables;
3. Learned about the different factors affecting growth (genetics; water, soil, light, temperature, and air);
4. Observed healthy growing;
5. Learned about the nutritional qualities of different vegetables.
6. Planned what vegetables they will grow in the garden.

3. Growth is affected by environmental conditions. Plants have preferred environments to grow but they can adjust to changes. Even the same plant can grow very differently in different places.

Activity 3a: children can compare the times when plants can come to fruit in different countries. When are cherries ready to pick in Madrid? When are they ready in Aberdeen?

Activity 3b: outside, children can make use of their senses to find out more about environmental conditions in the places where plants, herbs and vegetables can grow. Using symbols they can map areas of hot & cold; windy & sheltered; dark & light and record what types of plants are found.

4. Healthy growth is affected by light, water and soil. Plants adopt different strategies to make the most of light, to store water or to get the nutrients from the soil. Rapid stem growth and large surfaces may give leaves an advantage for obtaining light. Rapid growth however may also result in weakness and need for support. Pliable stems can recover from trampling and buffeting by wind. Stems that break cannot recover and the part of plant separated from water supplies then dies.

Activity 4a: Children may be encouraged to look for relationships between stem structures (hollow, solid; wooden, green; long, short) and height or pliability of the plant.

Activity 4b: Discuss why some plants tolerate a wide range of environmental conditions and so are widely distributed. Why others, instead, need specific conditions and are limited to the places where these conditions exist?

Activity 4c: Discuss what conditions do we have in Scotland, in Aberdeen, in our school grounds? How much sunlight do we have? What are the highest and the lowest temperature over the course of the year?



Activity 4d: in the school grounds, children can look for dead plants and discuss what might cause death (lack of water; lack of light; frost; excessive heat); they can discuss what it means for a plant to be 'dormant'.

5. Nutritional qualities depend on the content of different vegetables (biology; home economics).

Activity 5a: Children may look for differences between contents of different vegetables by **tasting samples** in class: watery cucumber; sweet apple; sturdy carrots to find out about water content; sugars and fibre. A discussion may follow about the importance of introducing those contents into our own diet to grow healthy. What happens to our skins when we do not drink or get enough fibre?

6. Space for growth: vegetables can grow to different sizes. Find out **how much** and **how big** a plant can grow and will it fit into the space allocated in the garden? When will the plant be ready to harvest?



The Mystery of Growth across the Curriculum for Excellence

Health and Wellbeing

- encourages children and young people to act as **positive role models** for others within the educational community
- leads to a lasting commitment in children and young people to follow a **healthy lifestyle** by participation in experiences which are **varied, relevant, realistic, and enjoyable**

Sciences

- develop **curiosity** and understanding of the environment and **my place in the living, material and physical** world
- demonstrate a secure knowledge and understanding of the **big ideas** and concepts of the sciences
- develop the skills of **scientific inquiry** and investigation using **practical techniques**

Literacy and English

- communicate, collaborate and build relationships
- explore the richness and diversity of language and how it can affect me, and the wide range of ways in which I and others can be creative

Religious and moral education

- investigate and understand the responses which religious and non-religious views can offer to questions about the nature and meaning of life
- develop the skills of reflection, discernment, critical thinking make a positive difference to the world by putting my beliefs and values into action

Numeracy and Mathematics

- develop a secure understanding of the concepts, principles and processes of mathematics and apply these in different contexts, including the world of work
- interpret numerical information appropriately and use it to draw conclusions, assess risk, and make reasoned evaluations and informed decisions
- apply skills and understanding creatively and logically to solve problems, within a variety of contexts



F/G. The secrets of the soil

What is soil?

1. **Soil** is a generic term referring to the land on which we walk, build roads and houses and grow our food. However, soil is more than just a 'flat surface'... there are different types of soil and a lot more happens under the ground than we may suspect.

Activity 1a: in class, children may be encouraged to give their ideas of 'soil'. They may be referring to a one-dimensional idea (e.g. surface), or they may use common words to talk about the ground (land; floor; ground; earth).

Activity 1b: different soil samples can be made available for children to manipulate.

2. **Core ideas** include **variety** of terminology used for **soil**: why do we have so many words to talk about it?

Activity 2a: Teachers may help children to reflect on the different uses of soil (for growing; building houses; transport; for standing up or lying flat) and the importance for human beings and other living things. What would happen if there was no soil?

3. **The word 'soil'** is used specifically to describe a section of the earth with particular qualities. **Key ideas** include **types of soil** which are different from each other depending on what they contain, how they are laid out (structure) and where they are found (climate and location). Soils can **change over time** depending on all these factors.



Previous Step: The mystery of growth

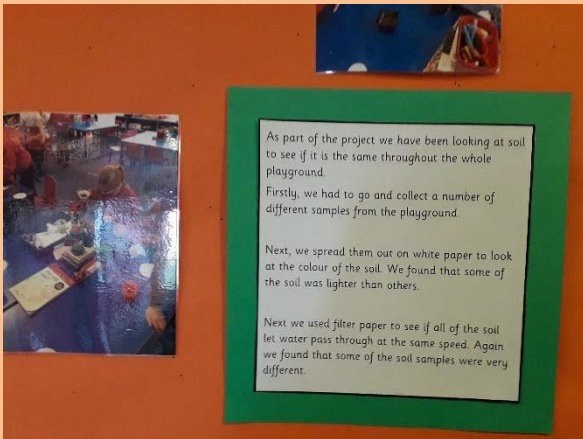
By the end of this month, pupils will have:

1. Understood the structure of soil;
2. Learned about chemical processes in the soil;
3. Discussed the different factors affecting soil quality (erosion; vegetation; carbon matter; climate);
4. Familiarised with different types of soil;
5. Made connections between soil types and nutritional qualities of different vegetables.
6. Reflected on how soil is used.



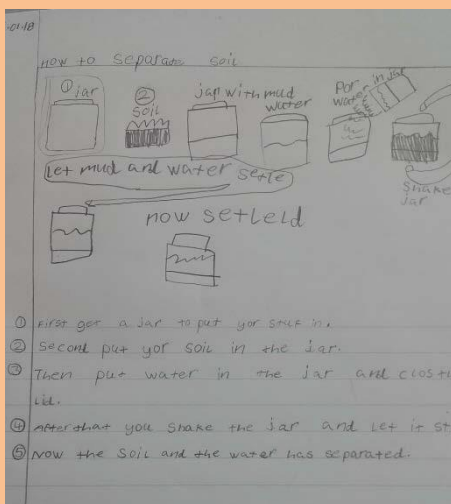
Activity 3a: outside, children can continue mapping the school grounds by taking samples of soil from different locations. Each location needs to be labelled clearly and marked on the map; all soil samples will be labelled and stored in small containers (*equipment*: selection of small plastic containers; shovel; map of the school grounds).

Indoors, children can compare their different samples and organise them by colour, wetness, and texture.



4. Soil types are affected by many factors. Core ideas include the ability of the soil to retain **water**

Activity 4a: different types of soil retain or release soil, depending on the ration between solid rock content (which provides drainage) and clay/organic matter content (which retains water). *The jar experiment* can help to visualize how the different materials react to water and what the soil looks like under the ground



Activity 4b: question time! What happens if all plants are taken away from the soil? What happens if too many plants are planted and harvested too often? Answering these questions leads to a discussion about **soil erosion** due to deforestation; **salty soil** due to water being pumped out of the ground in excessive quantities (e.g. for large-scale irrigation elsewhere), and **soil exhaustion**, when the soil is overused



5. Healthy soil/exhausted soil: farmers sometimes add calcium carbonate (e.g. fishbone meal) to the soil to raise the Ph to a suitable level. Airy soil can help the roots to breathe and provide energy to the plants to grow. Worms help with turning soil around and let air into the ground.

6. When the soil is at rest... in winter produce is available through preserves, stored in jars, under vinegar or oil.

Activity 6a: research what winter foods are available in different countries. Research the content: rich in... sugars? Butter? Oil? Vinegar?

The secrets of the soil across the Curriculum for Excellence

Health and Wellbeing

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Sciences

- develop **curiosity** and understanding of the environment and **my place in the living, material and physical** world
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Literacy and English

- explore the richness and diversity of language and how it can affect me, and the wide range of ways in which I and others can be creative

Religious and moral education

- investigate and understand the responses which religious and non-religious views can offer to questions about the nature and meaning of life
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Numeracy and Mathematics

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H. Crazy Compost

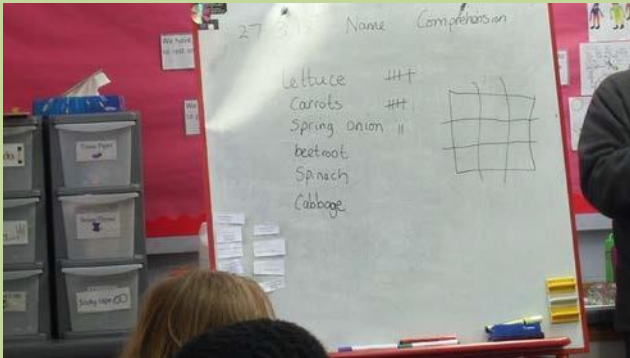


From rubbish to composting...

1. **Compost** is used to enrich the soil with nutrients and moisture. It is glorious as it is full of minerals and organic matter which is derived from the mulching and decomposing of other materials we no longer use.

2. **Key ideas:** compost is a mixture of materials which are brought together thanks to the demolishing actions of living organisms (both physical breaking and chemical transformations). In particular, organisms in the soil (worms, bacteria, fungi) have the important function of breaking bigger molecules into smaller ones which pass into solution into the soil and can be absorbed by the plants (cycling of matter). For good and effective composting action, we need organisms in the soil, plus water, air, sun and other plants (as the roots of the plants can help too!).

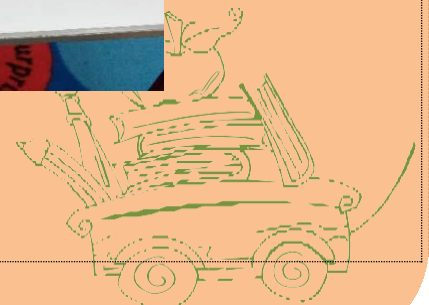
Activity 2a: cards illustrating different organisms and environmental factors can be taken into class for children to learn about and recognise. Drama-based activities can be used to illustrate the work of the different organisms in the soil and the interaction between the different elements.



Previous Step: Secrets of the soil

By the end of this month, pupils will have:

1. Understood the process of composting;
2. Learned about the role of microorganisms in the soil and the cycle of materials;
3. Learned to sort different materials for making compost;
4. Recycled materials for composting;
5. Collected organic waste for composting;
6. Built a compost bin;



3. Is compost a bit like recycling? Yes... and no... as not everything can be put into the mix for making compost. **Paper and cardboard** are good as they can be shredded and once in the soil, they are good for retaining moisture. Some food produce such as **egg shells** can also be used but not food waste, as it attracts rats near to the household. **Plastic and glass** will be discarded as normal into the recycling bin.

Activity 3a: sets of pictures showing waste products in common use can be used to practice the process of 'sorting out' waste for composting. The first distinction is between '**organic**' (contains Carbon, good for growth) and '**inorganic**' (it contains other minerals but not Carbon; it may contain other elements such as Nitrogen and Sulphur).



The sorting activity stimulates children to think in greater detail about '**rubbish**' as the undifferentiated material of which we ignore the origin or destiny. They are guided to '**make categories**' for practical use:

- i. Brown bin: for food waste which is not good in compost as it attracts rats and ice or because it would take too long to decompose.
- ii. Recycling bins: for cardboard, plastic and glass.
- iii. General waste: for all things that cannot be recycled.



Compost is a special category which is made of organic waste (such as vegetable remains and egg shells) but not cooked food; adding paper and cardboard can help to retain water and give texture, air and cohesion to the mulch. Ideas related to this can be linked backwards to the soil analysis conducted before.

Activity 3b: Children in the whole school can collect organic produce for composting in each of their classes from fruit snacks etc.

Activity 3c: with the help of the janitors and/or school technicians or parents, children can help build a compost bin for use in the garden.



Crazy Compost across the Curriculum for Excellence:

Health and Wellbeing

- engages children and young people and takes account of their views and experiences, particularly where decisions are to be made that may impact on **life choices**
 - uses a variety of approaches including **active, cooperative and peer learning** and effective use of technology
 - encourages children and young people to act as **positive role models** for others within the educational community
 - leads to a lasting commitment in children and young people to follow a **healthy lifestyle** by participation in experiences which are **varied, relevant, realistic, and enjoyable**
 - helps to foster **health in families and communities** through work with a range of professions, parents and carers, and children and young people, and enables them to understand the responsibilities of citizenship

Sciences

- develop **curiosity** and understanding of the environment and **my place in the living, material and physical world**
- demonstrate a secure knowledge and understanding of the **big ideas** and concepts of the sciences
- develop **skills for learning, life and work**
- develop skills in the **accurate use of scientific language**, formulae and equations
- apply **safety measures** and take necessary actions to control risk and hazards
- recognise the impact the sciences make on **my life**, the lives of others, the environment and on society

Social subjects and Technology

- engage in activities which encourage enterprising attitudes
- develop an understanding of concepts that stimulate enterprise and influence business
- Food and textile technologies
- Designing & constructing models/products
- Exploring uses of materials

Expressive arts and English

- Experiences in the expressive arts involve creating and presenting and are practical and experiential.
- Evaluating and appreciating are used to enhance enjoyment and develop knowledge and understanding.
- Extend and enrich my vocabulary through listening, talking, watching and reading



I. From small to big: Seeds and germination

Seeds, Tubers and Germination

Germination is the process of a plant developing leaves and roots from a seed. It is a process of slow change and transformation which we can observe as a series of stages. First we need to understand what a seed is.

Activity 1a: In preparation to the lesson, children can bring a selection of seeds **from home**. They can discuss **where and how they found the seeds**. **In class**, the teacher can prepare a set of boxes/bags containing different types of seeds. The task is to observe, measure, weigh up and draw the different seeds according to their relative sizes – from small to big, wide to narrow, light to heavy.



Depending on **shape, weight and size**, a seed can go faraway or go deep into the soil; some seeds can be carried and eaten by animals; others can float on water or fly in the wind. **Outside**, children can practice with making seeds fly: how far do they go?



Activity 2a: making seeds with paper mache is a fun way to learn about structure, and size and to celebrate seeds!

Activity 2b: Children may be encouraged to share their experiences with seeds; seeds feature in a range of stories (e.g. Jack and the beanstalk; Mabel's garden) and religious parables.



Previous step: Soil and Composting

By the end of this month, pupils will have:

1. Learned about different types of seeds;
2. Understood the relationship between seeds and environment;
3. Observed the process of germination;
4. Planned for growth cycles;
5. Practiced with germinating seeds and potatoes;
6. Understood germination of plants outdoor.

3. What does a seed need to grow? A seed can travel a long way before it settles. Children can compare it to a traveler equipped with all that it needs for the journey or a long stay i.e. a stockpile of water and food reserves to begin with. As the seed start growing, gradually water and sugars will be used up; hence we need to make sure seeds are watered and put into a good soil to grow.

Activity 3: Germination yoga. This activity dramatises the seed germination from when the seed is curled up tight, deep into the ground; reaching out for the backpack, cracking its skin, gradually swelling up and shooting the first root, growing a longer stem and the first leaf, to finally develop the full set of leaves opening to the light as a grown plant. Using a storyline, the teacher and germination yoga helps to understand how the seed is exposed to the weather and temperature; how it gradually develops tissues that stretch and change in shape and size. *And everybody's muscles get a stretch too!*



4. Seeds can start germination in a small pot. Why do we not plant small seeds directly outside?

Activity 4a. Children can discuss the different destinies of a seed; hence the need for plants to produce many in order to survive while the farmer must ensure that seeds do not get lost. Children can choose a seed to plant into a small compostable pot with soil and water for germination in class and to bring home.

Activity 4b: a seed can germinate into a glass jar to show the different stages of growth. Potatoes will be 'chitting' (growing small shoots) before they are put into the ground.

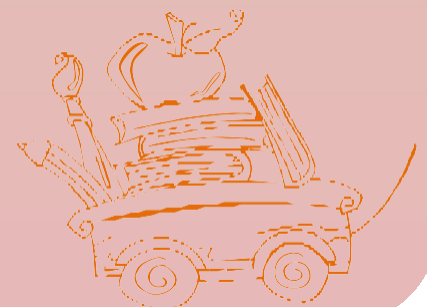


5. Growing seeds can be observed and taken care of on a regular basis. Children can develop a simple chart to record the process;

Date	Colour	Shape	Length	Notes

6. Children can design their own plant timelines and try to keep it updated. That could take place on a big poster on the classroom wall. There, they can keep a record of notes and pictures from the different stages of their plants. They can update it after every observation in the garden.

Activity 6a. Children can compare and discuss the results. Why are some plants taller than others? And what is the advantage of growing tall? The disadvantage? What colours are the leaves at the different stages?



From small to big: Seeds and germination across the Curriculum for Excellence

Health and Wellbeing

- encourages and capitalises on the potential to experience learning and new challenges in the **outdoor environment**
- encourages children and young people to act as **positive role models** for others within the educational community
- leads to a lasting commitment in children and young people to follow a **healthy lifestyle** by participation in experiences which are **varied, relevant, realistic, and enjoyable**
- helps to foster **health in families and communities** through work with a range of professions, parents and carers, and children and young people, and enables them to understand the responsibilities of citizenship
- harnesses the experience and expertise of **different professions** to make specialist contributions, including developing **enterprise and employability skills**.

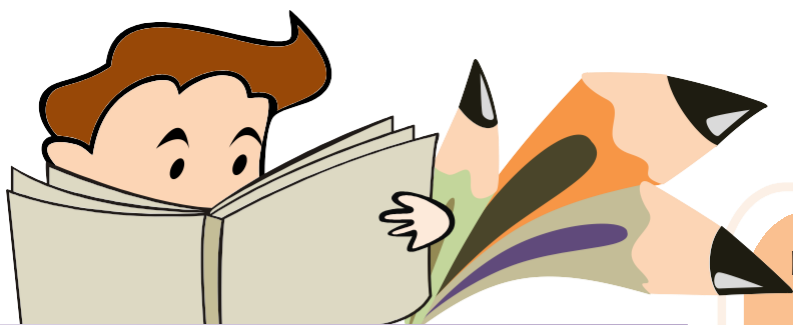
Sciences

- develop **curiosity** and understanding of the environment and **my place in the living, material and physical world**
- demonstrate a secure knowledge and understanding of the **big ideas** and concepts of the sciences
- develop the skills of **scientific inquiry** and investigation using **practical techniques**
- recognise the role of **creativity and inventiveness** in the development of the sciences
- develop an understanding of the **Earth's resources** and the need for responsible use of them

Literacy and English

- communicate, collaborate and build relationships
- reflect on and explain my literacy and thinking skills, using feedback and sensitively provide useful feedback for others
- engage with and create a wide range of texts
- explore the richness and diversity of language and how it can affect me, and the wide range of ways in which I and others can be creative
- extend and enrich my vocabulary through listening, talking, watching and reading.

J. From planting to growing!



From planting...

Planting involves the active process of nestling a little seedling into the ground. When planting, children will revisit, in practice, earlier ideas about what happens in the soil. Central considerations in planting involve: **physical space above ground and under the ground; watering; access to light; competition for nutrients.** We want to ensure that each plant can have enough nourishment in order to grow well.

1. The root system of a plant looks a bit like the hand of a child. **Activity 1a:** Children can be encouraged to reflect on what they do with their hands: reaching out; grasping; pulling; sensing and feeling. The bigger and stronger their hands, the harder they can work. **Similarly,** the roots of a plant will grow bigger and longer, to give the plant the ability to take increasingly bigger amounts of water and nutrients from the ground. Children may be encouraged to find pictures of vegetables growing. They can be guided to observe that a plant grows just as big 'under the ground' as it does 'above ground'.

2. Measuring the root area can help children make comparison with the height of a plant. **Activity 2a: outside,** children can be encouraged to look at roots and discuss why some plants have much bigger roots than others (e.g. trees as compared to grass). For example, big plants will need to go further to find water and woody roots will help the plant live longer.

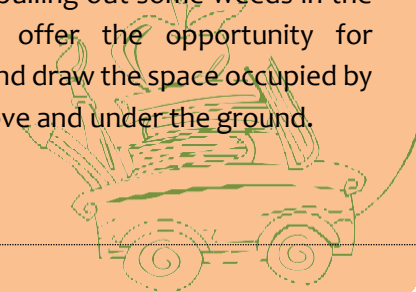
Activity 2b: outside, pulling out some weeds in the school ground can offer the opportunity for children to observe and draw the space occupied by leaves and stems above and under the ground.



Previous Step: Germinating seeds

By the end of this month, pupils will have:

1. Observed and drawn the root system of a plant;
2. Compared the space above ground with the space under the ground;
3. Traced the path of water inside the plant;
4. Divided the growing space in sections (1 foot square garden)
5. Learned about companion planting
6. Planted their selected vegetables and develop a watering and weeding routine



3. **Water** is the most immediate source of nourishment for the plant. Where does water come from and... where does it go to...?

Activity 3: by touching and observing a live plant, children can find out where water is stored (e.g. inside the leaves; in the petals; on the surface). They can compare what a veggie looks like when it is dry; or what it looks like when sprayed with water. Observations can also be made about the skin of a veggie: some are smooth and waterproof; others are hairy or with pores. How does water behave on each different surface?

4. All plants need to **share physical space** in order to get the benefit of light and sufficient volume of soil in order to grow stable and gain access to water and nutrients. For example, children can observe the space plants occupy in the school ground.

Activity 4: planting. Allocating space inside the planter can follow the rule of a **one foot square**. A planter of 1*1 meters can be divided into 9 squares.



5. In the same planter, some plants can benefit from each other and help each other to grow. The idea of **companion planting** is that specific plants, flowers or herbs are planted alongside the vegetable plants to protect the produce or enhance their growth by attracting insects (e.g. bees) for pollination; to repel pests or to act as food for pests (and thus protect the main crop from being eaten).



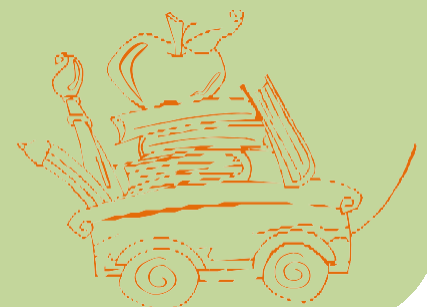
...to growing!

Activity 5a: Using a **companion planting chart** children can find out what are the best companion plants to use and decide how to arrange the different plants in the planters.

Activity 5b: children can discuss the concept of 'helping each other'. What happens when we help? What words can we use (e.g. to lend a hand; to support; to guide; to carry; to shelter and protect; to share...). They may be able to share stories of 'helping' or dramatise an activity.

Activity 5c: compare companion planting with large-scale agriculture. What do they look like? What about variety of crops? And what about pest control?

Activity 5d: Each child can plant seedlings or seeds in the planter in the allocated space. Planting involves handling of soil and making sure the seed is covered well with soil and watered.



From planting to growing across the Curriculum for Excellence

Health and Wellbeing

- engages children and young people and takes account of their views and experiences, particularly where decisions are to be made that may impact on **life choices**
- takes account of research and successful practice in supporting the learning and development of children and young people, particularly in sensitive areas such as **substance misuse**
- uses a variety of approaches including **active, cooperative and peer learning** and effective use of technology
- encourages and capitalises on the potential to experience learning and new challenges in the **outdoor environment**
- encourages children and young people to act as **positive role models** for others within the educational community
- leads to a lasting commitment in children and young people to follow a **healthy lifestyle** by participation in experiences which are **varied, relevant, realistic, and enjoyable**
- helps to foster **health in families and communities** through work with a range of professions, parents and carers, and children and young people, and enables them to understand the responsibilities of citizenship
- harnesses the experience and expertise of **different professions** to make specialist contributions, including developing **enterprise and employability skills**.

Sciences

The sciences framework provides a range of different contexts for learning which draw on important aspects of everyday life and work. Learning in the sciences will enable me to:

- develop **curiosity** and understanding of the environment and **my place in the living, material and physical world**
- demonstrate a secure knowledge and understanding of the **big ideas** and concepts of the sciences
- develop **skills for learning, life and work**
- develop the skills of **scientific inquiry** and investigation using **practical techniques**
- develop skills in the **accurate use of scientific language**, formulae and equations
- apply **safety measures** and take necessary actions to control risk and hazards
- recognise the impact the sciences make on **my life**, the lives of others, the environment and on society
- recognise the role of **creativity and inventiveness** in the development of the sciences
- develop an understanding of the **Earth's resources** and the need for responsible use of them
- express opinions and **make decisions** on social, moral, ethical, economic and environmental issues based upon sound understanding
- develop as a **scientifically-literate citizen** with a lifelong interest in the sciences
- **establish the foundation** for more advanced learning and future careers in the sciences and the technologies.

K. Tending to the gardens



From planting to tending...

Tending involves the active and ongoing process of observing plants as they grow and maintaining the garden in the appropriate conditions.

Key ideas include: cooperation and competition for water, light and space amongst different living things in the garden and including human beings!

1. Linking back to the previous step – planting – growing food in planters or confined spaces like gardens depends on having adequate space both above and underneath the ground in order to grow healthily. Ongoing observations of seedlings as they grow are important as gardeners can check if such conditions are met.

Activity 1a. in the garden, children can make close observations of the growing space. What are the **general conditions of the seedlings**? Are there broken stems or squashed plants? If yes, who may be responsible, and what protective measures can be put in place? The teacher may facilitate a discussion with the children on how the garden may be protected from vandalism, the unwelcome visits of dogs, accidental damage or the feasting of snails?



Activity 1b. further observations may involve making **comparisons amongst plants of the same kind**. Do they all grow in the same way? What is their colour? And what are the conditions of the soil? Is it wet, too wet or too dry?



Previous Step: Planting and growing

By the end of this month, pupils will have:

1. Observed and recorded the growth of the plants;
2. Established a watering and weeding routine;
3. Measured and drawn stems, leaves, branches;
4. Described and communicated observations about leaf colour, shape, size, presence of flowers;
5. Recognised possible signs of hampered growth;
6. Taken responsibility for rubbish, debris, pests.



A **watering routine** will need to be established. In some cases, plants may be growing too close to each other and compete for light. If that happens, seedlings may be gently uprooted and replanted further apart.



2. Plant growth can be **observed and measured** both in numbers and with verbal descriptions. Through measurements, children can appreciate that similar plants may display different **growth rate** – that is - the height and length of the stems over time.



Through **verbal descriptions**, children can pay attention to the appearance of the plant: does it look healthy? And what does healthy mean? Particular features may include the **strength** of the leaves and stems (a healthy plant will have sufficient water content to ensure all green parts are strong and turgid); **colour** (discoloration of the leaves may be indicative of lack of nutrients in the soil); presence of **parasites**.

Activity 2a: a garden **journal** with simple tick boxes can be developed to incorporate observations over time.



3. The garden space is inhabited by many **living things**. Some may be occasional visitors; cats or dogs for example may leave traces. Cat poo may need to be regularly removed from the growing space. The soil will also attract other plants which had not been intended to grow in the garden, such as weeds.

Key idea: the term **weed** is often used negatively to refer to unwanted plants in the growing space. Weeds are an important source of food for insects and particularly pollinators (such as bees). However, weeds may not be of direct use to humans while competing with the crops for water, light and soil space.

Activity 3a: what is a weed? It is important for children to recognise what weeds are, why they are called 'weeds' and the roles they play in the garden.

Activity 3b: establishing a weeding routine. In groups, children can take responsibility for specific sections of the garden; decide how much and where weeds may be left to grow while ensuring they are regularly removed from the growing space.

Tending to the gardens across the Curriculum for Excellence

Health and Wellbeing

- uses a variety of approaches including **active, cooperative and peer learning** and effective use of technology
- encourages and capitalises on the potential to experience learning and new challenges in the **outdoor environment**
- encourages children and young people to act as **positive role models** for others within the educational community
- leads to a lasting commitment in children and young people to follow a **healthy lifestyle** by participation in experiences which are **varied, relevant, realistic, and enjoyable**
- helps to foster **health in families and communities** through work with a range of professions, parents and carers, and children and young people, and enables them to understand the responsibilities of citizenship
- harnesses the experience and expertise of **different professions** to make specialist contributions, including developing **enterprise and employability skills**.

Sciences

- demonstrate a secure knowledge and understanding of the **big ideas** and concepts of the sciences
- develop **skills for learning, life and work**
- develop the skills of **scientific inquiry** and investigation using **practical techniques**
- develop skills in the **accurate use of scientific language**, formulae and equations
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- develop as a **scientifically-literate citizen** with a lifelong interest in the sciences
- **establish the foundation** for more advanced learning and future careers in the sciences and the technologies.

Numeracy and Mathematics

- develop a secure understanding of the concepts, principles and processes of mathematics and apply these in different contexts, including the world of work
- interpret numerical information appropriately and use it to draw conclusions, assess risk, and make reasoned evaluations and informed decisions
- apply skills and understanding creatively and logically to solve problems, within a variety of contexts



From tending to harvesting...

Harvesting food from plants is both a task and a celebration. It is the culmination of ongoing care, collaboration and partnership with both human and non-human life.

Key ideas include: cooperation and competition for produce; harvesting in succession; picking and sharing produce.

1. Plant produce can be **observed and measured** both in numbers and with verbal descriptions. Through measurements, children can appreciate that produce comes in different shapes and sizes. Produce is normally **weighed in Kg**.



Previous Step: Tending

By the end of this month, pupils will have:

1. Discussed and shared favorite vegetables
2. Prepared and planned for harvest
3. Involved the community
4. Written blogs and newsletters
5. Collected recipes
6. Revisited knowledge and expectations about growth
7. Assessed factors for growth or lack of growth/death of plants
8. Planned for watering and harvest during the holidays.



Activity 1a. A simple table can be devised to record the weight of the harvest.



Activity 1b. Through verbal descriptions and physical handling, children can pay attention to the appearance of produce. Is the external skin lucid/shiny or opaque? What is the thickness of the skin?



Activity 1c. The observation and study of the appearance of vegetables can lead to questions and discussion about why some vegetables have managed to grow to size and others might have not; observations may focus on possible diseases affecting the crop or perhaps on whether conditions which might have helped with exceptional growth.

Activity 1d. Children may wish to research on the biggest vegetable ever produced or find out about vegetable exhibitions in parks and garden centres.



2. Harvesting is an important activity in many cultures across the world. **Festivals related to the harvest** involve the whole community in sharing food and eating together. Produce can thus be prepared for **cooking and sharing** in the community.

Activity 2a. in class, children can discuss favorite dishes and find out about the ingredients. Each child can bring home some of their favorite vegetables to share with their family.

Activity 2b. parents can become involved in harvesting by sharing recipes or ideas for cooking particular vegetables. Each child may be given a task to collect a recipe from home to share in schools.

Activity 2c. in class, children may be engaged in writing a blog or a newsletter about the harvest and publish some of the recipes they have collected.

Activity 2d. with the help of the headteacher the school may organize an **end of year picnic** to invite parents to visit the garden, pick some vegetables and enjoy some of the cooking.

Activity 2e. A group needs to be created to maintain the garden and harvest produce. **And note... harvesting continues after summer with the late potatoes... through to Halloween!**



Harvesting across the Curriculum for Excellence:

Health and Wellbeing

- uses a variety of approaches including **active, cooperative and peer learning** and effective use of technology
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- harnesses the experience and expertise of **different professions** to make specialist contributions, including developing **enterprise and employability skills**.

Numeracy and Mathematics

- develop a secure understanding of the concepts, principles and processes of mathematics and apply these in different contexts, including the world of work
- interpret numerical information appropriately and use it to draw conclusions, assess risk, and make reasoned evaluations and informed decisions
- apply skills and understanding creatively and logically to solve problems, within a variety of contexts

Religious and moral education

- investigate and understand the responses which religious and non-religious views can offer to questions about the nature and meaning of life
- develop respect for others and an understanding of beliefs and practices which are different from my own
- make a positive difference to the world by putting my beliefs and values into action
- establish a firm foundation for lifelong learning, further learning and adult life.

M. From harvesting to cooking!



From harvesting...



Previous step; harvesting

By the end of this month, pupils will have:

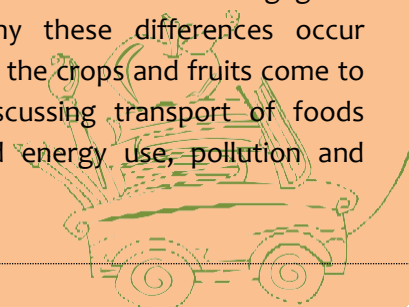
1. Harvested vegetables which are ready to be gathered.
2. Helped in the preparation of vegetables for eating.
3. Learned about the preparation and cooking of vegetables.
4. Read and prepared recipes.
5. Written their own comments about the food they have prepared and cooked.



1. **Harvesting** requires consideration of the seasons and the development of crops over a period of time, how they develop and when they are ready to be harvested.

Key idea: seasonality; different crops can be planted and harvested at different times of the year. By considering seasonality of vegetables and where they come from children can begin to address important themes linked to sustainability, such as food miles and transport.

Activity 1a Knowing that different vegetables are in season at different times of the year helps children to appreciate how different foods and recipes have been developed for different times of the year. Children can gather information on what is available in local supermarkets and compare with a Scottish crop calendar to see where the supermarket varieties come from. Teachers can use this to engage in discussion around why these differences occur (climate, sun) and how the crops and fruits come to our supermarkets. Discussing transport of foods leads to ideas around energy use, pollution and sustainability.



2. Learning to grow and prepare local vegetables that are available 'in season' is an important step in understanding sustainability. It also links with other concepts such as time, the weather and the seasons (latitude). Children will also learn that the nutritional value and taste of foods is best when the food is in season. Such understanding can be enhanced through activities linked to tasting of food.

Activity 2a. The "Taste Adventure". Using their five senses of taste, touch, smell, hearing and sight, children can explore the different properties of vegetables, foods and spices. With sufficient practice, children will be able to develop these senses and learn to appreciate the different qualities of foods and how they can be used in food preparation.



Activity 2b. The classroom restaurant. After harvesting and cleaning crops that can be eaten raw, such as lettuce, radish, carrot, rocket, the classroom can be turned into a taste appreciation restaurant. Children can taste each of the crops; feel the crunch and sense their flavour, and be asked to write a sentence about each of them.

Activity 2c. Scoring and sharing. They can also give a score out of 10 for each of the crops they have tasted. The class can then discuss their experiences and whether they have tasted these crops before. They can also discuss why different people experience tastes in different ways and what types of foods are healthy and why they are important nutritionally.



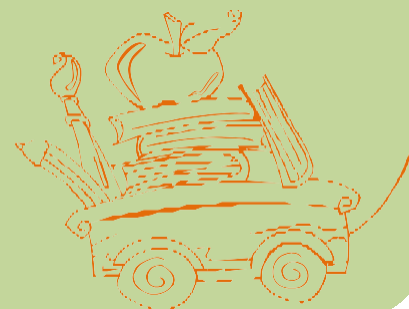
...to cooking!

3. Food preparation. As well as understanding the seasonality of foods, and developing sensory appreciation of the diverse qualities of different fruits and vegetables, it is important for children to begin to develop some culinary life skills.

Activity 3a. If you can enlist the help of the school canteen staff, it may be possible to use the crops harvested from the garden to prepare a small meal for children and parents.

Activity 3b. If the canteen staff, or suitably experienced external people from the community, are willing, it may be possible to take small groups of children at a time to prepare simple meals in the school canteen, or kitchen, if available.

Activity 3c. As "homework", children can take the crops home and, with the help of their parents, prepare the food for their family and write a report about how they found it. Recipes or the grown produce can be sold at a small price to increase revenues for the garden; but vegetables can also be used for art work and fancy displays.



From harvesting to cooking across the Curriculum for Excellence

Health and Wellbeing

- Learners develop their understanding of a healthy diet, which is one composed of a variety and balance of foods and drinks.
- They acquire knowledge and skills to make healthy food choices and help to establish lifelong healthy eating habits.
- They develop an appreciation that eating can be an enjoyable activity and understand the role of food within social and cultural contexts.
- They explore how the dietary needs of individuals and groups vary through life stages, for example during pregnancy and puberty, and the role of breastfeeding during infancy.
- Learners develop knowledge and understanding of safe and hygienic practices and their importance to health and wellbeing and apply these in practical activities and everyday routines including good oral health.
- They develop awareness that food practices and choices depend on many factors including availability, sustainability, season, cost, religious beliefs, culture, peer pressure, advertising and the media.

Sciences

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A School Garden Calendar

Month	Topics	Curricular links, competences and skills	Materials
Mid-August/ September(*)	<p>School grounds and school gardens</p> <p>Survey of the school grounds:</p> <ul style="list-style-type: none"> - Find out about growing spaces in the school - identify plants, animals and human activities - sun and shade; mapping the soil (covered; exposed) - touching/feeling materials and surfaces for growth - discuss and harvest what might be edible/non edible 	<p>Surveying the ground</p> <p>Measuring lengths and areas</p> <p>Making sketches, drawings, maps and plans</p> <p>Discussing and making decisions Observing and record-keeping</p> <p>Asking questions</p>	A. From School Grounds... to School Gardens.
	<p>Planning and designing</p> <p>Children develop a design for the gardens to include containers of different size and shape; paths and other features.</p> <p>Designing a garden:</p> <ul style="list-style-type: none"> - size, shape and location; - paths and decorative features - estimating materials (wood; soil) and access to water taps 	<p>Keeping a school garden journal</p> <p>Drawing and Observing: Leaf colours, shapes; sizes; disposition.</p> <p>Researching school gardens</p> <p>Discussing the design of the school garden</p> <p>Suggesting containers of different varieties, sizes and shapes to be placed in the garden</p>	B. Designing and Constructing a garden
	<p>Reviewing designs</p> <p>Reviewing plans outside; measuring space and agree final plan:</p> <ul style="list-style-type: none"> - measuring using tape-measures; using the body to measure; - Observing how much space is used by different plants growing at different sizes. 	<p>Measuring spaces for planting in the school garden</p> <p>Locating the planters in the measured space</p> <p>Creating paths in the garden</p> <p>Allocating plants to planters depending on size and sun exposure</p>	C. Measuring and Estimating
October	<p>Growth</p> <ul style="list-style-type: none"> - What is 'growth'? (i.e. growing bigger, longer; different from/similar to...) - What can you grow?(vegetables; herbs; bushes; trees) - Seasonality: what grows/when? - selecting seeds and types of plants to grow - Rate of growth - Growth and death 	<p>Discussing and sharing ideas about growth</p> <p>Observing growth</p> <p>Discussing conditions necessary for growth</p> <p>Researching different types of vegetables</p> <p>Sharing knowledge of Scottish foods and vegetables</p> <p>Choosing produce to grow</p> <p>Selecting spaces to grow their vegetables</p> <p>Listing vegetables to be grown</p> <p>Comparing nutritional qualities of different vegetables</p> <p>Discussing death</p>	D. The mystery of growth E. What can you grow... in Scotland?

November	<p>Soil</p> <ul style="list-style-type: none"> - What is soil? - Soil analysis - Soils around the world - Soil erosion - Garden name and logo design. - Changing weather/changing soil: observation of wet soil; cold soil; frozen soil. - Investigating where the sun goes to in winter 	<p>Comparing the different types of soils from the school garden Separating the different types of soils from the school garden Discussing the soil types from the school garden Touching and feeling different soil types Designing simple experiments to show different types of soil from the school garden Mapping the course of the sun across the seasons</p>	F. The secrets of the soil
December	<p>Winter food</p> <ul style="list-style-type: none"> - Preserves, jams and compotes - Tubers - Making winter puddings; - Making winter stamps - Winter dishes from different countries 	<p>Discussing what produce is available in winter Researching how to preserve produce in winter Preparing dishes with winter produce Making art and getting to know winter produce</p>	G. When the soil is at rest...
	<p><i>This is the pre-Xmas period. Teachers can continue investigating growth, tubers and soil if they wish.</i></p>		
January	<p>Soil and Composting</p> <ul style="list-style-type: none"> - Who lives in the soil - Rubbish in the soil: understanding organic and inorganic products - The roles of air, water and microorganisms - Enriching the soil: compost - Making compost: from rubbish to humus - Sorting out waste in the school kitchen - Building a compost bin 	<p>Exploring soil Understanding decay and recycling of minerals Feeling and making soil texture Finding out about microorganisms Sorting out rubbish Re-using materials</p>	H. Crazy Compost.

February	Germination <ul style="list-style-type: none"> - Different types of seeds - Environment and seeds - The process of germination - Growth cycles - Germination activity with seed potatoes - Seed germination in class. - Seed germination in the nursery - Germination of wild plants outside 	Exploring different types of seeds Comparing several seeds, tubers, roots, shoots and leaves to get to know the variations in structure and appearance. Drawing several seeds, tubers, roots, shoots and leaves and comparing relative sizes Describing and enacting the life cycle of a sunflower from seeds through germination, and maturation to the development of seeds Carrying out an experiment to surface the basic needs of vegetables (sunlight, air, water, and soil)	I. From Small to Big: Seeds and Germination.
March	Planting and Growing <ul style="list-style-type: none"> - Competition and companion planting - Germinating plants in the garden - Planting in vertical growing spaces or in pots - Watering - Tendering; caring; - Prepare text for the school's web-page 	Preparing the ground Allocating space for different plants Spreading compost Sowing of seeds or seedlings Establishing watering routines Weeding Updating the garden journal	J. From Planting to Growing.
April	Maintenance and Care <ul style="list-style-type: none"> - Planting, writing, observing, talking. - Outdoor planting after Easter. - Weeds and pests. - Care and attention. 	Recording observations on plants in school garden journal Maintaining (watering, weeding) plants in the garden Measuring stems, leaves, branches Drawing plants Asking questions Describing leaf colour, shape, size, flowers Removing rubbish, debris, pests	K. Tending to the Gardens.
May	Harvesting and Tasting <ul style="list-style-type: none"> - Continuation of planting – different crops – idea of crop rotation. - Favourite food - Famous dishes - Different vegetables for different countries - Open garden day for community 	Discussing their favourite vegetables Planning to harvest Involving the community Writing blogs Collecting recipes Revisiting knowledge and expectations about growth Assessing factors for growth or lack of growth/death of plants	L. Harvesting
June	Harvesting and Cooking <ul style="list-style-type: none"> - Continue planting for over the school holidays - Harvesting and healthy eating – nutritional qualities: fibre, nutrients, vitamins, water. 	Harvesting of vegetables Cooking of vegetables in the school kitchen Eating of vegetables in the school canteen Writing down comments on paper Planning for watering and harvest during the holidays	M. From Harvesting to Cooking.

*This calendar of activities is aimed largely at pupils and teachers who may wish to get started on a garden project. We recognise that in some schools a garden may be already present. In that case, for the August/September months there will be harvesting and planting to do as the garden space is already available. In other cases, the survey of the grounds is aimed at getting children to find out if there are plants already growing in the school grounds and plan for further growth.