



School Composting

A Manual



Getting more out of the organic cycle



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This manual can also be downloaded on <http://www.vlaco.be/en/vlaco-vzw/info>

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PART 1 – SETTING UP A SCHOOL COMPOSTING PROGRAMME

1. INTRODUCTION

Bio-waste is the most important fraction of the municipal solid waste (MSW). More or less half of the municipal solid waste is biodegradable. Also the waste from schools contains lots of organic material. Therefore, when going for recycling and closing the material loop, the first focus should be on bio-waste fraction. Some schools took the initiative to start with experimental campaigns in the field of School composting.

School composting can be an exciting way to get the entire school community working together to help the environment. Why, how, when ... composting? This manual will help you address these important issues.

Goals of this manual

These goals can be:

- To provide a model for initiating and implementing a school composting program;
- To help schools reducing their waste stream and increase their recycling rate;
- To teach students the importance of responsible waste disposal and the advantages of composting.

You will find strategies for initiating and developing a plan, routine steps of the composting operation, promotional activities, as well as lessons and resources for curriculum connections in this guide.

Reasons for composting

Schools can help the environment and their community when they compost food scraps. There are additional, far-reaching benefits of a composting program for the school community. Within the classroom, science concepts related to composting are easily integrated into science, math, social studies and language arts curricula. Taking responsibility for the solid waste stream empowers students. Students may spread the compost message and be instrumental in starting composting at home or in their neighbourhood.

People often have preconceived ideas (odours, vermin's, ...) and fears about composting. A thoughtfully-planned school composting program can successfully address these issues.

2. START UP

The idea for school composting may come from teachers, an administrator, parents, the students, the school director, the school administration, an environmental club Regardless of who initiates the program, you want to have the support of the school administration. A Compost Program Steering Committee can benefit from the leadership skills of a school administrator. One may find ways to fit compost tasks into the routine school duties of the staff and by encouraging integration of composting concepts into the curriculum.

Developing a Plan and Gathering Support

Talk up the topic of composting and you'll probably find other staff members who are supportive of the idea. Learn as much as you can about what is involved in school composting. It's okay to start with a small pilot

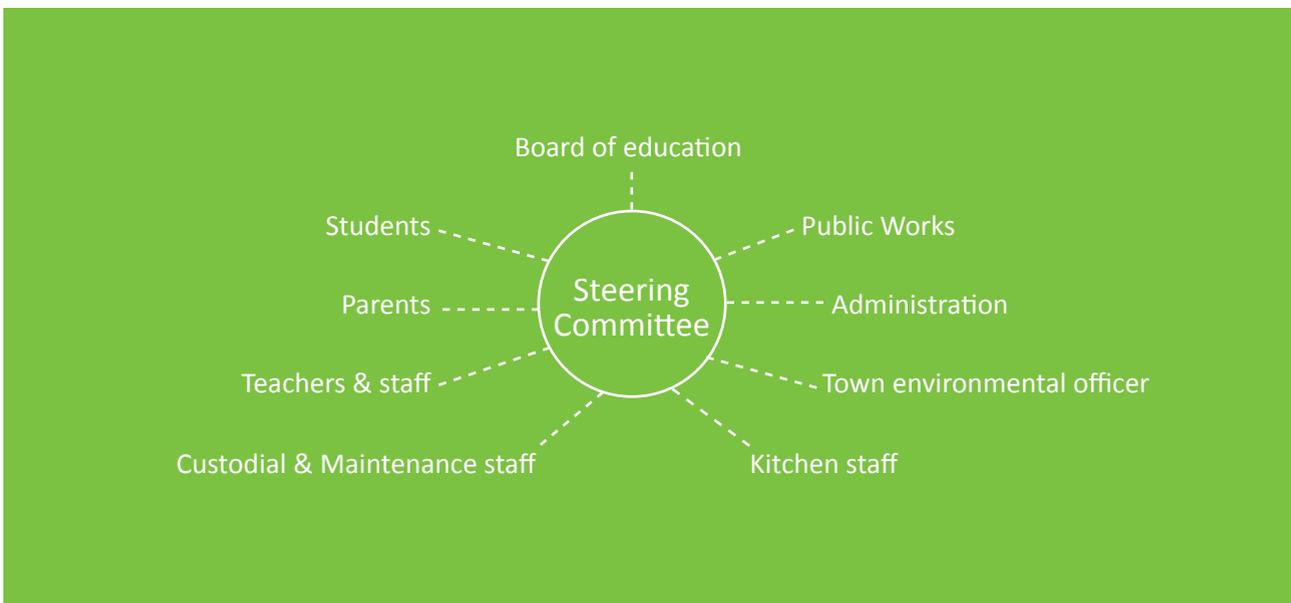
program or to develop the program in phases. Schools differ in the way they develop new programs; follow what's the best system for you. Follow these steps for developing a successful program:

- Step 1. Share your ideas and seek out others who may be supportive of the idea
- Step 2. Recruit a core group of people to develop the idea (Steering Committee)
- Step 3. Research what is involved in a school-wide composting operation
- Step 4. Clearly define the scope of the project (it's okay to start small)
- Step 5. Follow the school system protocol for developing new programs
- Step 6. Get support from all components of the school community

As with any new program, there will be successes as well as problems with which to deal. It's important for the morale of the Steering Committee to pay attention to small successes. Don't expect 100% compliance by students/staff when it comes to daily sorting of lunch scraps. You will need a plan to actively recruit compost-workers.

Forming a Steering Committee

Effective leadership from a few staff members who are committed to making school composting a reality is critical to the success of the program. In the best case, the steering committee is composed as follows:



Identify in committee each member's responsibility. The Steering Committee is responsible for developing a clear plan of action, promoting the program, coordinating the actual work, and evaluating what's working and what's not. Make sure that members are willing and are able to commit the time. Expect to meet once a month at least, for the first year of the process. As the program matures, quarterly meetings will be sufficient.





The Steering Committee will also need to search a compost box design that best suits the needs and must investigate methods to find funding.

Involving the School Community

A composting program will affect all school personnel, so it's important to know their concerns. This involves clear communication among school community members, and taking the time to communicate with individuals and groups about their roles in implementing the composting program.

The Role of Teachers

Teachers are important for the involvement of students in the program. They will be instrumental in introducing the composting program to the students and integrating the ideas and concepts into school curricula. The help of teachers will be needed to monitor student food-sorting at containers in the cafeteria and supervise student compost-workers.

Try these ideas to get teachers involved:

- **Audio Visual Introduction:** Make it easy for the teachers to introduce the composting program by providing a video or PowerPoint presentation. This way, the teachers learn along with the students.
- **Curriculum Materials:** Display curriculum materials related to composting in the teachers' lounge or library.
- **Service Learning:** Encourage using the compost project as a service learning project (groups take the responsibility for routine compost operations).
- **School Climate Committee:** Composting could be part of the overall plan to make the school a place where everyone shares (climate) responsibilities.
- **Curriculum Integration:** Each school can introduce the subject of composting as part of the curriculum standards or as an optional course.



The Role of Students

Implicitly, all students will (or can) be part of the program by sorting their lunch wastes daily in the cafeteria. Some students may want to be a part of the compost team that helps with daily tasks. They will also be your advocates for the program.

It's good to start educating students about composting at the beginning of the school year. Initiating the youngest students into the routines of sorting their lunch wastes means they develop composting habits early; as they get older, they become the role models for younger students.

Recruit a group of five to ten students to become the core composting team. With adult supervision, two students per day can handle the daily tasks of the composting operation. Another way to get students involved is to invite them to serve on a committee that will design incentives to promote the program among the student body.

It's important to keep the student body motivated. Give special recognition to participants (public address announcements, certificates, prizes, T shirts, ...), get press coverage, put up signs and posters to show progress.

Support from Other School Community linked people

MSW

The Municipal Solid Waste Management (MSW) official brings local expertise to the composting program. He/she can help with educational resources and facilitate compost box design selection and operation. The role of the municipality as liaison between the partners may be critical in the development of the program. The municipality might also help parent, teacher and student volunteers learn the daily composting routines and monitor the progress of the composting process. If a town does not have a MSW official, other members of the staff must share these tasks. You may find resource people in the community through a garden club, a local conservation organization or town committee.



Maintenance staff

The maintenance staff should be consulted when selecting a location for the compost boxes, so that practical considerations for machinery and delivery of bulking materials can be addressed. If the maintenance staff will be building the composter, ask for their input in the design and put it in as a work order several months in advance. Ask for suggestions and feedback from maintenance staff.

Kitchen staff

Discuss the needs of the kitchen staff with them. The kitchen staff may already be placing food preparation scraps in one barrel, and it may just be a matter of providing a second barrel for packaging wastes such as plastic or foam trays. Food scraps such as vegetable peelings, coffee grounds and old produce can be easily deposited into a separate barrel. Respect their time and ability to make good decisions and ask for their suggestions.

Parent & parent school committee

Composting is a positive way to get parents involved in the school. A presentation about the composting program at the parents school committee meeting should outline the goals of the program and how parents can help. The parent group may take on the program as a project, help fund the cost of boxes or provide incentives for student workers. An information article in the schools newsletter will help spread the word.

Promotional Activities

In most cases, you will have to win over the minds and hearts of students and staff to the idea of composting. Although the very act of sorting food waste daily will eventually prove to most skeptics that composting is “no big deal,” promoting your program can go a long way toward getting voluntary participation and raising awareness. It is one thing to promote a new program, yet it is just as important to do so as the program matures.

Regular promotion aids that steady progress. Planning any promotional activity requires time. For this reason, it is essential for the long-term success of a school program to have a core group (Steering Committee) that can commit the time to plan and carry out these events. Examples of possible events are:

- Compost Awareness Week (to introduce): This works well in September, after the students have been given some basic instruction and are getting used to the food-sorting system.
- Compost poster contest: Offer prizes for posters that teach about composting or motivate students to do their part; could be part of an art class on creating posters.
- Compost advertisements: Offer prizes or course credit for radio jingles or television commercials; a local radio station may play the winning jingles. This fits in well with language arts lessons. A special trip: Students could earn points for volunteering to be part of the compost team. Points are accumulated toward a special trip.
- Student Council: Get the Student Council to take on the compost project as one of their priorities; they'll think of fun incentives.
- ...

Of course the school homepage features a link to their compost webpage. The site includes a description of the school compost program, the basics of composting and activities for kids.



3. INFRASTRUCTURE

Now that you have rallied the support of the school community, formed a Steering Committee and developed a clear plan of action, it is time to look at the compost program infrastructure. Being familiar with how the composting process works and the necessary tools required to launch a successful program will aid the Steering Committee in deciding on compost box design, location and supplies.

Composting Equipment

All parts of the composting process have to be in place before you can begin daily operation. When you prepare and plan well, you present the image of a well thought-out program and assure good public relations for the school composting program. However, recognize that no matter how well you plan, there will always be some kinks as you proceed.

The tools you will need, anyhow:

- Compost boxes
- Cloth rags
- Rake and/or shovel
- Pitchfork or garden fork
- Work gloves
- Scale
- Clip board with record sheets
- A steady supply of bulking material such as leaves, wood chips, wood shavings
- Labelled food waste barrels or receptacles on wheels
- Sifting screen



Compost Boxes

Design

There are several compost box designs appropriate for a school-wide composting program. Constructing, rather than purchasing a commercially built model, will result in boxes suited to the particular needs of your school. Take the necessary time to think about your needs and research various designs.

Constructing the compost boxes can be accomplished by various members of the school community. If the Public Works Department or school custodial staff construct the boxes, be sure to ask for their input about design and materials. Alternatively, construction of compost boxes could be a student project accomplished by an after school club, industrial arts class, or a technical school project.

Location

Think this through carefully; once the compost boxes are in place, it is difficult to relocate them. Boxes need to be located in a convenient place and should be built on level grass or soil for drainage. Consider using gravel, wood chips, or another porous material around the perimeter of the boxes (to avoid the soil to get muddy). The route to the boxes should be level for ease of transportation of food barrels. Boxes must be accessible for machinery so that bulking materials can be delivered and deposited beside the boxes. Do not place boxes directly against the school wall; leave a three foot space behind them for cleaning spillage.

For aesthetics and safety reasons, boxes should be located behind the school building or a partition, in a low foot traffic area. But, at the same time, put the composting boxes in an airy, dry and (half) shaded place in the garden. A composting box with its legs in water will not operate properly. Make room also for yourself so that you can 'work', screen, transport the material to and from the boxes with a wheelbarrow. Do not barricade the composting boxes in an inaccessible place.

Box size

The minimum recommended box size for active decomposition is one cubic meter. This is the size box a homeowner would typically use. Larger boxes are not really practical because turning the compost becomes a very hard physical work. Because a school will generate more food waste than the average household, it is best to use a series of these boxes. A series with common removable walls and fronts allows compost to be turned from one box to the adjacent box conveniently. In Part II will be explained how to manage the composting process.





The number and size of boxes you will need depends on the amount of food waste you expect to generate. One way to estimate the amount of food waste is to collect and weigh food scraps from the cafeteria (plate scrapings) and kitchen (prep waste) for two weeks. Consider adding more boxes when. Ultimately, the dimensions and style of the compost boxes may be determined by the space available.

Ease of Use

The easier and safer the boxes are to use, the happier everyone will be. Boxes should be well constructed and maintained so that workers can easily lift the lid, remove components (such as side slats), dump food wastes and spread bulking material without obstructions. Maintenance is important; loose screening, nails or hinges can be risky to workers.

Building materials

Consider the long-range life of the materials, their cost, availability and ease of construction. Ideally, you want materials that will not rot easily. Wood, impregnated with unsafe chemicals, should be avoided. Woods such as cedar or locust are naturally rot-resistant. Think about building boxes from reused or recycled materials. Wooden pallets, often obtained free from local businesses, are a convenient size for the frame of a compost box. Make sure the pallets are all the same size before you start banging them together!

Whether the composting boxes are made of plastic elements, concrete slabs or wooden boards has little or no impact on the composting process. An important drawback of wood is that it rots, however this problem should not be exaggerated. A composting box from strong boards can last for five years. At that time some of the planks and the bottom boards may have to be replaced. If you treat it with any (environment friendly) wood treatment solution, then it will last longer.

Ease of construction

Whoever builds the compost box must have well drawn design plans and a materials list. The usual tools for a building project will normally suffice. Try to build the boxes in place; it is too difficult to transport them, especially a design of multiple boxes sharing interior walls.

During the construction you already have to keep three things in mind:

- 1 Ensure the box has a removable front. (see Part II – Understanding the composting process).
- 2 Use wide boards, with narrow gaps.
- 3 Foresee something to protect the boxes from the rain and the sun (e.g. a sort of roof)

Costs

The capital expense of the compost boxes and tools will vary depending on the materials you select. It will cost something, but it doesn't have to be a budget-buster. Search for funding possibilities, second-hand materials ...

After the initial purchases, realize that composting is a low-cost process. There is very little maintenance and the labour is volunteered. In fact, a compost program can be cost-saving. If food waste is a significant portion of the school's waste stream, you may see a drop in refuse weight, and in turn, lower collection cost tip fees.

4. COMPOSTING PROCESS ITSELF

The actual details of the composting process will be explained in Part 2 – Understanding the Composting Process.

Day-to-Day Composting Management

Student and staff volunteers will need to be trained in the daily routine of processing the food scraps. Scheduling the composting tasks depends on the school lunch schedules, the availability of volunteers and what works best for kitchen and custodial staff involved.

Daily Tasks

A team of for example two or three students, supervised by an adult, can carry out the following daily tasks in about fifteen minutes. All these tasks take place in the first box.

- Task 1: Collect food scraps
- Task 2: Weigh food scraps
- Task 3: Transport food scraps to boxes
- Task 4: Take compost temperature
- Task 5: Spread food scraps
- Task 6: Layer with bulking material
- Task 7: Clean-up

Task 1: Collecting food scraps

Food scraps are deposited into special containers located in the kitchen. One or two labelled food waste barrels should be provided in the kitchen for food preparation scraps, leftover food and coffee grounds. Kitchen food scraps should be transported to the compost box daily.

Other sources of food scraps are the teachers' lounge ,classroom equipped with kitchen facilities... These outlying school areas can be added once the kitchen routine is in place. It also means that you must plan for regular pickup of these food wastes. If they are not picked up regularly, they may become full or smell unpleasant, resulting in negative publicity for the compost endeavour.



Task 2: Weighing food scraps

Students place the bag of food waste in a container on the scale to weigh (subtract the weight of the container) and record the amount of food. Recording the weight serves several purposes. It can be used to keep track of the total amount of food processed in a given amount of time, which shows the savings in the disposal of solid wastes produced by the cafeteria. The total weight of the food wastes can be compared to the weight of the compost product. Weight records can be used for constructing math problems or analyses in science classes.

Task 3: Transporting food scraps to the compost boxes

The barrel is carried to the boxes. Students need to pick up work gloves, pitchfork and the thermometer.

Task 4: Taking compost temperature

This activity should be carried out daily for a certain period of time (e.g. before & after turning). The long probe of the compost thermometer is carefully pushed into the centre of the compost pile where it is the hottest. The temperature is read and recorded on the chart. Taking the temperature of the pile is a way to monitor the progress of the compost.

Task 5: Spreading food scraps

The easiest way to manage the food waste is to empty the food waste barrel into the compost box, on a regular base. Food should be spread somewhat, not piled high in the centre of the compost box.

Task 6: Layering with bulking material

A few cm of wood chips, wood shavings or dry leaves should be spread regularly with a pitchfork to cover the food completely, making it less attractive to animals.

Task 7: Cleaning-up

Students use cloth rags (and water if available) to wipe off the shovel and thermometer, store equipment, and return the barrel to the cafeteria.

Tasks as needed

Checking and maintaining boxes

The supervising adult should report any structural problems with the boxes to the project director so that they can be remedied quickly to avoid safety issues and animal entry.



Turning the pile to the next box

See Part II – Understanding the composting process

Troubleshooting

Someone needs to take on the responsibility for making sure the composting process is working and address any imbalance in carbon, nitrogen, water or oxygen (see also Annex II - Composting Problems and Solutions).

Acquiring Bulking Material

A system for maintaining a supply of bulking material (or brown material) next to the boxes is important. An arrangement with third parties can be made for dumping leaves, wood chips or sawdust.

5. YOU HAVE COMPOST – WHAT NOW?

In a school composting system, many kilograms of food can be turned into useful finished compost over the course of a school year. Remember, the total amount of material (food wastes plus bulking material) is reduced by as much as two thirds during the composting process.

Testing and Using Your Compost

Realistically, a successful composting process will result in dark, crumbly, sweet-smelling compost in about 6 months to a year (depending on conditions). The nutrient and salt content of the compost depends on the types of foods that are included. Just because the compost looks and smells like soil doesn't necessarily mean that it is chemically stable. Partially-composted material placed directly on garden plants will burn the tender shoots and roots, due to the high unstable nitrogen and salt content. Finished compost should have a near neutral pH, be low in unstable nitrogen (ammonium nitrate) and soluble salts, and high in stable nitrogen. "Curing" is simply letting the pile rest while the composting process finishes. Getting a soil sample analysed is the best way to determine the compost's usability. Check with the local department of the Ministry of Agriculture whether there is a laboratory that can analyse the nutrient levels of the compost. Ask for the standard soil test plus salts. Send a representative sample of the compost (about two cups) in a sealed plastic bag and puncture-proof packaging.



There are many uses for finished compost. It will have varying levels of potassium, phosphorus, and nitrogen, all important plant nutrients. But different plants have different nutrient requirements. It is best to use the finished product as either a soil improver, by mixing it into garden soil prior to planting, or as a top dressing for existing plants. If the primary bulking material is wood chips, the finished compost will still contain bits of wood chips. This is perfect for mulching around the school's trees, shrubs, and other perennials. If the desired end use of the compost is for potting soil, it will need to be screened. Compost that is high in soluble salts will interfere with plant growth and may even kill seedlings, so particular care needs to be given to the soil analysis. As long as the compost is within a medium range, it can be mixed with equal amounts of sand (or vermiculite) and peat moss. If the soil analysis indicates that the compost is high in soluble salts, use a lower percentage (25 to 15%) of compost in the mixture.

Composting ties in nicely with a school greenhouse operation. A homemade potting soil makes a nutritious growing medium and can eliminate the use of chemical fertilizers. Plants grown in the greenhouse could be used for science lessons, school beautification projects as well as for fund raising events. Used potting soil and unwanted or dead (but disease-free) plants from the greenhouse can be added to the compost pile, thereby closing the loop in organics recycling.

Program Evaluation

The Steering Committee should meet regularly to evaluate the implementation and success of the compost operation. Feedback from various staff members will help address the following questions:

- Is the daily processing of food scraps running smoothly?
- Are the boxes and equipment in good repair?
- Are the students and staff volunteers working well?

- What is the general attitude of the students and staff about the composting program?
- What adjustments can be made to make the process more efficient?
- How can we recognize and celebrate our accomplishment thus far?

A short annual summary report discussing the success of the program and tallying the tons diverted from disposal could help justify continuing the program.

Taking the Step to School Composting

School composting has many benefits for the students, their school and their community. Armed with this guide and enthusiastic leadership, your school can be on the road to composting. All schools are different – see what works for you.

Your program will be successful if you plan well and communicate with the members of your school community. Seek out interested members of community groups such as garden clubs, scouting groups and conservation organizations. Be patient; even small steps move you toward the goal of school-wide composting. Get people involved with incentives that thank them for doing their part. Let everyone feel good about the progress of the program call attention to your successes through newsletters, poster and school announcements. Take the next step in recycling. You can make school composting happen.



PART 2 – UNDERSTANDING THE COMPOSTING PROCESS

1. COMPOSTING PROCESS

What is composting?

When leaves fall from a tree, they decay into soft black humus over time, without any help from people. Anything that once lived will eventually decompose. Dig down into the earth of the forest floor and you will find a rich, dark layer of topsoil up to several inches thick. A major component of topsoil is humus, the result of decomposition of plant and animal material that accumulates on the forest floor. Billions of decomposers convert the nutrients into humus. Fungi, bacteria and actinomycetes break down fibrous plant material. Worms and insects tunnel through the debris, shredding and chewing as they go. Leaves are broken down physically and chemically through digestive processes; the excreted material becomes humus. Without decomposers, critical nutrients would not be recycled for plant growth.

Composting is a process that wants to happen naturally. Everywhere in the air and in bio-wastes there are micro-organisms and their spores. They are only waiting for the right moment to start the digestion of organic matter. A sufficient moisture and oxygen content are sufficient for them to start their work.



If you do composting for the first time and are impatient, you can get from a farmer or a home composter a bucket of half-digested compost that has a smell like forest soil. This very young compost will contain everything that you need. Mix it to your own bio-waste when the temperature peak has dropped, so the worms do not die right away. Special preparations, starters and accelerators that you find in the (department) stores are totally unnecessary.

Finished compost has the distinctive fresh smell of newly-turned soil or a forest floor in spring, and won't heat up again no matter how often you turn air into the pile. The ideal result of the composting process is crumbly, dark, soil-like humus where none of the organic material can be identified. The nutrients stored in compost depend on the richness and variety of its ingredients, and on its exposure to harsh weather.

When to start composting?

If you plan to compost your waste, then start as soon as possible. But think it over carefully before you start. First select the system which fits best to your place and select the best place for it. It has no real significance on which day of the year you start composting. The middle of the winter is not really advisable because the nature and decomposing organisms rest at that time.

How does composting work?

Composting with green and brown

In a compost pile, people provide optimum **food, moisture and oxygen** for the decomposers to grow and reproduce continually.

Decomposers need nitrogen to build their cells; food scraps and grass clippings are excellent sources of nitrogen. We often call it 'green' or 'fresh' material. Wood chips, dry leaves and sawdust are rich in carbon, a source of energy for the decomposers. In composting jargon, these carbon sources are called 'brown' or 'bulking' material.



It is beneficial to maintain a balance of browns (carbons) to greens (nitrogen) in a compost pile to give the decomposers a balanced diet. Alternating 'brown' and 'green' material in the first box helps maintain this balance.

The drier the brown materials are, the more they help the compost pile to stay light and loose, allowing air to circulate more freely. A compost pile that is too wet will compact and begin to smell as the result of anaerobic (bacteria that does not require oxygen) bacterial action. A compost pile should be humid or moist, but not soaking wet. Foods have a high moisture content, and are usually wet enough to keep the pile moist. Regular turning aerates the pile and mixes the browns and greens. It is easier to remedy a situation that is too high in carbon than one that is too high in nitrogen and has become wet and smelly.

Key points – Materials to use

Greens	Browns
Coffee grounds	Coffee filters
Flowers	Corn cobs
Fruit and fruit peels	Grass clippings (dried)
Grass clippings (fresh)	Hay
Manure (plant eating animals)	Leaves (dead)
Tea leaves	Pine needles
Vegetables and peelings	Sawdust
Weeds	Straw
	Wood chips
	Kitchen paper towel
	Cut-up wood cuttings

This list is far from complete. Anything organic can, in theory, be composted – some more easily than others. But common sense suggests a few exceptions.

Very important: the following materials may cause problems in a backyard compost pile.

Materials to avoid

- Pet wastes can contain harmful bacteria
- Rotting meat, fish, fats and dairy products are likely to smell and may attract pest vertebrates
- Insect-infested or diseased plants may persist in the compost
- Weeds with mature seeds, and plants with a persistent root system may not be killed by the heat of the composting process
- Ashes from open fire, soil and sand, sauces, grease and oil, bones and animal wastes

Moisture

Moisture is essential for all living organisms. When an actively composting mixture's moisture content fall to between 35 and 40%, (where water makes up 35-40% of the total weight), decomposition rates slow significantly as microbes stop their metabolic activities; below 30% moisture they really stop. On the other hand, too much moisture can quickly lead to anaerobic microorganisms as water fills in all tiny spaces in the mixture. This wet condition is not favourable for microorganisms that require oxygen (aerobic). At the same time ideal conditions are created for microorganisms that don't require oxygen (anaerobic). This can result in offensive odours.

Oxygen

Aerobic decomposition is the preferred method of small scale composting. When there is insufficient oxygen, conditions favour anaerobic microorganisms – this results in a less efficient process and the production of undesirable odours. In this way, moisture content and oxygen availability are linked: while microbes require moisture, material that is too wet and heavy will not have room between the particles for air to diffuse into it.



Compost in boxes

What are the preconditions for the boxes ?

During the construction you had to keep in mind three things:

- 1 Ensure the box has a removable front. This allows you to turn the composting material comfortably. Turning is of fundamental importance in composting, as you will see in this chapter.
- 2 Use wide boards, with narrow gaps. The (wooden) boards insulate the compost both from cooling down and from drying out. The gaps between them allow the inflow of oxygen rich air into the material. The gaps should not be wider than 1 to 2 cm. If the gaps are wider than 5 cm, the content of the box dries out (or falls out) easily. If you use pallets, the large gaps between the boards can be reduced by nailing on an extra board between them.
- 3 Cover the box. The (half) mature compost takes up water easily and in large quantities. Therefore, the compost in the last box(es) should be protected with a roof. Under the roof the compost can evaporate the excess moisture by being protected from the rain.

How to manage the process?

Box 1

Reserve the first box for fresh kitchen and garden waste supplies. The more effort you make to mix the green and the brown materials properly in this first box, the better your composting will be right from the beginning. Following each new addition, the volume will again decrease.

Optimal mixing in practice is not always possible, but it is not a problem in this first box. In the summer there is always an excess of grass, in the autumn there are always more drier leaves, and when you start cutting the hedge, the cuttings come after each hedge is cut. One should therefore take care to keep browns aside so as to allow proper mixing each time kitchen waste is added to the first box.

Box 2

The second box is reserved for the result of the first turning. With a fork you take the material out from Box 1. This works best if you take out its front plate. Then you scrape everything out from it, mix it, aerate it, and then throw it into Box 2.



If you did not delay this first turning for too long and the composting was not in a very advanced stage, then in a short time you can expect that the process will be at its peak. This is shown by the warming up of the compost. An increase of temperature of 50 °C or more is not exceptional. Your compost may be so hot that you cannot keep your hand in it. Congratulations, you succeeded in making the decomposing organisms work hard!

A working compost pile will go through stages, getting hotter as the decomposers work and reproduce, and then cooling off. Temperatures can reach 65°C if conditions are favourable (after turning). If the compost cools down before most of the decomposition has occurred, it is a sign that the balance of food, moisture, air needs to be adjusted. Usually, a drop in temperature indicates it's time to turn the pile by forking it into the neighbouring compost box.

It is recommended to make a small roof above the second box (and the eventual following boxes). This is especially important when the composting process has progressed a little, and when it rains regularly. Do not cover the compost directly with a plastic or wood board. It is important to allow air circulation between the compost and the roof.

Even if during the filling up of the composting box or the boxes you paid attention to the right proportion of brown and green materials and to their proper mixing, there are some effects which make the material heterogeneous:

- the outsides dry out due to the wind;
- inside, due to high temperatures, a dry core may develop;
- certain materials do not mix too well and become sticky or form a dry core;
- the top layer is exposed to external effects, sometimes becoming moist from rain, sometimes drying out because of the wind.

Therefore the compost should be turned one more time at least one month before to use.

Box 3

If the compost in the second box still not meets your expectations after a few months, then live up the composting process once more with a second turning. While the first turning was about mixing, here the emphasis is primarily on aeration.

Turning of the compost is always a moment of temptation. As a result of the work a loose mixture is observable, which guarantees further composting. On the basis of the consistency test one can decide to do some extra moistening. One can discover several 'composting friends', and with all his senses one can enjoy the transformation processes which cause these. Turning is a unique opportunity to discover your compost from the inside.

Make sure that you cover Box 3. In this last phase it is good if your compost becomes a little drier. Now it is mainly the moulds doing the processing, and they, in contrast to the bacteria which were working in the initial phase, work better under lower moisture conditions. Maturing and the accompanied nitrification (the transformation of ammonia to nitrate) are improved if the material is somewhat drier. The pH of the drier compost is also more neutral. Lastly, a somewhat drier compost is also more comfortable for you. Drier compost is lighter and it is easier to shovel, screen and spread on the ground.





The system of boxes and turnings means that you can only turn one box when the next box is empty.

Key points to remember

- use (more or less) equal amounts of 'greens' and 'browns';
- mix together a variety of ingredients,
- shred or chop all ingredients, if possible;
- build the box/ pile large enough to retain heat;
- turn or aerate the box/pile regularly to let the air in;
- keep the pile as moist as a damp sponge.

2. QUALITY AND USE OF YOUR OWN-MADE COMPOST

Compost Quality

Three things can help you to determine the quality of compost.

- 1 What materials you did put in
- 2 How you followed the composting process
- 3 Some simple observations.

The end quality of the compost is determined by the materials that were processed. If you added mainly kitchen waste and grass, then the nutrient content will be high. If you compost a lot of hedge cuttings and pruned branches, the nutrient level will be a little bit lower. In both cases your compost will be interesting for your plants, mainly as a soil amelioration material and a humus source.

The composting process itself is at least as important as the input materials. Regular aeration, turning, the provision of moisture and covering guarantees a homogeneous end-product that is well matured, has a moisture content that is not too high, a stable nutrient content, a neutral pH, contains few seeds capable of germinating (weeds), has a salt content that is not too high and a balanced nutritional value.

There are some simple tests that you can easily carry out yourself that will give you a good picture of the quality of your compost. If your compost shows good results in the following tests, you can rightly assume that more expensive chemical analysis would also show positive results.

Take the samples always from the inside of the compost. Don't be misled by the outside appearance of the compost. This, in the majority of cases, is dried out or, due to violent rainfalls, is, on the contrary, soggy. Its temperature will also differ from the inside temperature.

- During and at the end of the composting process put some compost regularly in your hand and observe it. If you see a lot of life in the material, you made a good work. Worms, millipedes, mites, but also white mould strands of moulds all indicate a healthy decomposition process.
- Smell it. Compost with an unpleasant smell does not contain sufficient oxygen needed for good composting. Kitchen or garden waste put in a few weeks or months ago has been only partially digested. In the course of good composting special fauna and flora will become active. The same organisms can be found in forest soil, and many of them generate odorous materials from which they can be identified.



- As the compost ages it becomes crumbly. Compost ready for use is a mixture of half-digested branches and leaves mixed with very fine crumbly clay and the faecal matter of worms and other compost-organisms.



- A higher temperature in the compost (after turning) than the outside temperature is a clear sign of (digestion) activity. Temperatures higher than 50°C give proof of the fact that weed seeds and pathogenic bacteria were destroyed (of course only in those places where the temperature was really that high). For good composting (for nitrification, for the development of worms and similar organisms, for the evaporation of the excess moisture, etc.) a temperature of 20 to 30°C is enough.
- Kneading test: the kneading or fist test gives a good picture on the structure and moisture content of the material to be composted. They together tell much about the quality of the compost. Take a handful of compost and squeeze it in your fist. A. If no water is squeezed out, the compost is too dry. B. If many drops can be squeezed out, the compost is too wet. C. If few drops can be squeezed out, the moisture content is ideal.



- A final test to determine whether the end-product is suitable for sowing and planting into it is the planting and sowing test. It is obvious that first you should test it on some seedlings and with some seeds to see if any problem occurs. This way you can prevent any future disappointment. If you think that the salt content of your compost is quite high, make a test using diluted compost and mix one part of compost with two parts of (pot) soil and/or sand.



Compost use

Compost improves soil quality in several ways. Compost is the best food for soil organisms. They combine the organic material from the compost with soil particles into crumbly soil. The plant roots can grow well in this while searching for water, air and nutrients.

If you use new compost still containing significant amounts of half-digested leaves, bark and branches, the soil organisms, including worms, will still find many good nutrients in it. This is also good for the soil structure. The nutrients from the compost will slowly get available for the roots during the coming months.

The best use of such young compost is to spread it as soil cover or mix it only with the top few centimetres of the soil.



If you let your compost mature more into a very fine, crumbly end-product, then there will be less work for the soil organisms, but the nutrients will be released faster. The matured compost can be worked into the soil and you can use it as a base material for making potting soil.

Finally you yourself have to find out how you can fit your own-made compost into your garden cultivation in the best way. Both quality and use differ considerably from garden to garden. Quality is determined by the input materials, the number of turnings, the handling of moisture content, the weather conditions, etc. And use depends on the type of garden you have, on the type of soil, on your own gardening experience, etc.



ANNEX I: Frequently Asked Questions about Composting

People who have little or no experience with composting often have several questions about the process.

What is composting?

Composting is a natural biological process, carried out under controlled conditions, which converts organic material into a stable humus-like product called compost. During the composting process, various micro-organisms, including bacteria and fungi, break down organic material into simpler substances. Composting is an aerobic process, meaning that the micro-organisms require oxygen to do their work.

What can be composted?

Composting has the potential to manage all of the organic material in the waste stream which cannot otherwise be recycled. Some examples of organic material that can be composted include food scraps, leaves and yard wastes, agricultural crop residues and (some) paper products. Meat scrap, fish and fish bones as shells need to be excluded.

Can composting manage all our wastes?

Since a large amount the waste stream is organic matter, composting can play an important role in the integrated waste management plans of any community. However, the remainder of the waste stream (such as items made of plastic, glass, metals, ceramics and rubber) cannot be composted. For this reason the bio waste need to be collected separately! Good source separation is necessary to become a high quality compost

Is composting compatible with other waste management systems?

Yes. Composting should be part of a comprehensive waste management system that emphasizes source reduction, reuse, composting and recycling, and proper disposal of any residual material.

What are the benefits of a successful composting program?

In addition to diverting a large proportion of the waste stream away from disposal, an effective composting program can produce a high quality soil improver with a variety of end uses. Diverting organic wastes from landfill sites helps to conserve landfill space and to reduce the production of leachate and methane gas (both of which add to the cost of operating a landfill).

Is composting new?

No. Agricultural wastes have been composted forever, it's a natural process that occurs spontaneously.

How long does the composting process take?

A number of factors are important in controlling the composting process and the time that the process takes. These factors include temperature, moisture, oxygen, particle size, the carbon-to-nitrogen ratio of the waste and the degree of mixing or turning involved. In general, the more actively these factors are controlled, the faster the process.

The length of the process also depends on the degree of decomposition desired in the finished product. Typically, an immature compost can be produced in about a month, while a mature compost may be allowed to cure for six months to a year.

What is the best location for a backyard composter?

Put the composting boxes in an airy, dry and (half) shaded place in the (school) garden. A composting box with its legs in water will not operate properly.

Make room also for yourself so that you can work, screen, transport the material to and from the boxes with

a wheelbarrow. Do not barricade the composting boxes in an inaccessible place.

Can I compost in the winter?

Yes, theoretically you can compost year-round. As the temperature falls, microbial activity decreases but it starts up again as soon as the weather warms up. To make room for your winter organics, empty the finished compost from your unit in the fall. You may also want to move the unit to a more accessible location for the winter. Also, organics can be collected in a covered container stored just outside the back door. In the spring, the collected organics can be added to your composter. Kitchen wastes are high in nitrogen so you need to add lots of leaves or something rich in carbon to be sure that you have the right carbon-to-nitrogen ratio needed for the microorganisms to be most effective.

Is composting a lot of work?

No. Remember, the decomposers of the pile do most of the work for you. Keep the process simple and convenient. Containers for food scraps must be conveniently located and clearly labelled. The compost box should be located conveniently. Boxes must be easily accessible during winter and for delivery of all organic materials. Bulking (or brown) materials should be located near the box. Keep materials and tools readily available. Turning the pile does take muscle and time, which requires planning ahead. Take the time to develop a well-trained and responsible compost team.

Are special additives required?

In some cases, such as in the composting of grass clippings, the raw material may be too dense to allow for the proper flow of air or may be too moist. A common solution to this problem is to add a 'brown' agent, such as wood chips, to provide structure to material and to allow for proper air flow. Some facilities add commercial fertilizers to their composting process, but this is not necessary. Inoculating the material with microbes is not required, since most wastes naturally contain the microbes needed for successful composting to occur.

Will the compost pile look unsightly?

No. The compost box should be sturdily built of preferably durable materials. A poorly-constructed or maintained box begins to fall apart, attracting animals and becoming unsightly. Selecting a site that is behind the (school) building or is hidden from view by shrubs or a fence will decrease chances of vandalism.

Will the compost pile smell disgusting?

No. A compost pile with the right balance of food wastes and bulking materials, moisture, and oxygen will provide a habitat that will allow the composting organisms to thrive. A working pile typically develops an earthy odour. Mature compost has a crumbly, moist texture and looks like dark soil. Foul odors are a sign that the pile is out of balance and requires a remedy such as more frequent turning (aeration), a change in moisture level or food supply.

Isn't composting dirty and messy?

No. The composting routine is most pleasant if the area is kept tidy and well maintained. Any spillage of food scraps or bulking material should be cleaned up as part of the daily tasks. Composting tools conveniently located, clean and ready to use.

Can people get diseases from handling composting food wastes?

No, not typically. The heat, ranging from 55°C to 65°C generated by a thriving colony of decomposers, kills most pathogens. However, staff and students should wear gloves when participating in the compost operation as they may come in contact with food that has not yet decomposed into inert compost. Mature compost can be handled like soil, with or without gloves. (Wearing gloves also guards against the drying effects of soil and compost on the skin, washing hands is important after doing garden work, in order to avoid diseases.)

What if the compost pile doesn't heat up?



The odds are that an inactive compost pile just doesn't have enough "greens" in it to start its temperature rising. The answer is to rebuild the pile with more high nitrogen materials. That will probably solve the problem, but also check that the pile is as moist as a wrung-out sponge.

Is compost a fertilizer?

Compost can contain varying amounts of nutrients such as nitrogen, phosphorus and potassium. However, the concentrations of these nutrients in compost are lower than those found in common fertilizers. Compost is best described as a soil improver or soil conditioner which returns valuable organic material to the soil. In addition, compost does benefit the soil by improving soil structure, aeration and water retention.

How can I get more information about (home or school) composting?

For additional information about composting, please write to **Vlaco npo, Stationsstraat 110, 2800 Mechelen, Belgium** or Email us at **ThuisKringlopen@vlaco.be**. Specific information about the composting initiatives in your community may be obtained by calling your local municipal recycling and composting.

When is compost 'finished' and safe to use?

When an active compost pile fails to heat up once more, and very little of the original material can be recognized, the compost is ready to use. It will have a rich brown colour of good soil & smell something like humus of a forest floor.

ANNEX II: Compost Problems & Solutions

Problem	Cause	Solutions
Compost pile contains earwigs, slugs and/or other insects	Pile is composting correctly	Insects are a good sign of a productive compost pile
Compost pile is attracting raccoons, dogs, flies or other pests	Amount or type of greens incorrect Exposed food scraps Compost box needs repairs	Avoid meats, bones, oils Place food scraps in centre of piles and cover completely with browns Keep the box well maintained
Compost isn't heating up	If it seems damp and sweet-smelling, it may be a lack of nitrogen Not enough moisture Not enough oxygen Pile may be too small (less than a cubic yard)	Mix in food scraps or other materials high in nitrogen Add water Turn or fluff the pile Build the pile up to 1m x 1m x 1m
Temperature levels off	More food scraps needed Composting is finished	Add more greens If it looks dark and crumbly and smells earthy, it is time to remove compost and let it cure Begin a new pile
Matted, undecomposed layers of leaves or food scraps	Compaction, poor aeration	Break up layers with garden fork, or shred them, then re-layer or turn the pile Avoid adding thick layers of bulking material
Large, undecomposed materials	Size and composition of materials	Screen out undecomposed items, shred and reuse in new pile Reduce particle size by shredding
Compost pile has a bad odour like a mixture of rancid butter, vinegar and rotten eggs	Not enough oxygen, compaction Not enough oxygen, too wet	Turn the pile and shake material to loosen and aerate Turn the pile and add coarse dry material such as leaves, wood shavings, sawdust, straw or shredded newspaper to soak up excess moisture
Compost pile has a bad odour like ammonia	Pile may have too much nitrogen	Add materials high in carbon such as leaves, wood shavings, sawdust, straw or shredded newspaper Mix in to aerate



ANNEX III: Compost Box Construction

A very inexpensive box can be made using wooden pallets. These boxes cost almost nothing. This design includes a removable front to make it easy to turn the compost.

Materials

Four wooden pallets
32 wood screws or bailing wire
Four bolt latches

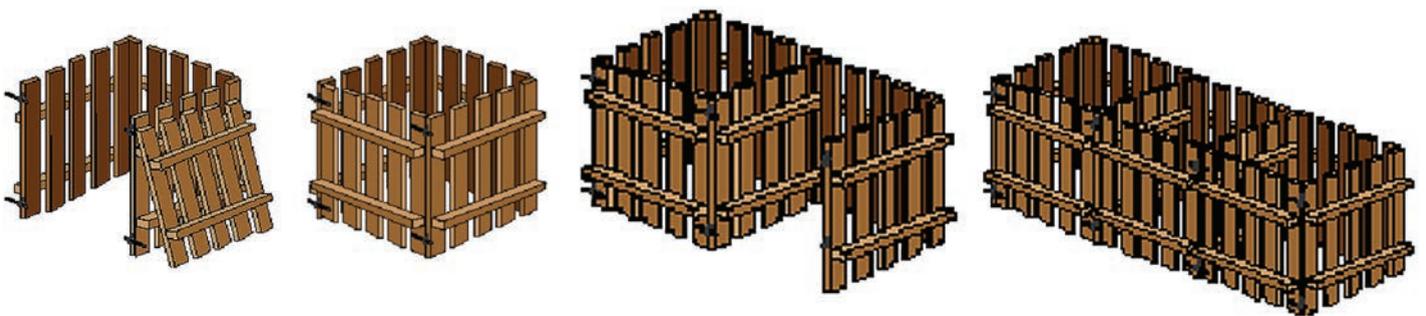
Building a Wooden Pallet Box

Assembly is easy, just screw or wire three of the pallets together. Attach bolt latches to the front edge of the box and the last pallet to make a removable door.

Variations

This box can be easily converted into a two box system using just 7 pallets.

In a two box system, the compost is turned by emptying the full (first) box into the empty one and back again. If you have lots of compostable material you could expand it to a three-box system using 10 pallets. You build a pile in the first box turning it into the second and then the third.



ANNEX IV: Specific Compost Lessons

These lessons and activities were designed to be used with middle school students, but can be adapted to other grade levels.

Contents:

- I Compost Survey
- II Compost Introductory Lessons
- III Compost Exhibits
- IV Compost Labs
- V Compost Tour
- VI Ort sort
- VII Composting classroom quiz



LESSON I: COMPOST SURVEY

Grade	4 - 12
Objective	The goal of the Compost Survey is to assess the experience, knowledge, and attitudes of your students as they apply to composting. The overall scores on the two parts are designed to give you a general idea of student knowledge about composting and should be used along with teacher observation to determine your compost education strategies. The items on the survey can also generate an interesting discussion about composting.
Activity description	The survey statements (part I & II) are briefly explained, the papers (copies) handed over to students, filled in and finally results are discussed in a group session.
Materials needed	Paper and pen
Key vocabulary	Compost, lunch, food, sorting, biodegradable
Duration	30 to 50 minutes depending on age group & extend of discussion
Skills used	Observation/ classification/ motor skills/ computation

The survey can be given shortly after the initiation of a school composting program and again half way through the school year or at the end of the school year. This use is similar to a pre- and post-test; the student responses are a measure of the change in their compost knowledge and attitudes over time.

The first year of a composting project may move along in fits and starts while you are finding ways to make the composting routine work. The survey could be a useful assessment tool at the start of the second year of the project with students who have been in the program for the previous year. This will give you some measure of the progress you are making with the students' grasp of the composting ideas. At that time, the survey could also be administered to students new to the program to help you decide what compost education will be needed with the new group.



Part I –The Survey Statements

A response of “always” is an indication of some knowledge and a positive attitude toward composting. Students can add up the number of responses in each category and multiply times a value to get their score:

Never = 1

Sometimes/usually = 2

Always = 3

Part II – True or False Statements

After students complete their responses to Part II, the teacher should take the opportunity to make this a learning experience. One way to do this is to have the students discuss their answers in groups of three; encourage them to support their answers. If a student wishes to change a response, he/she could write the new response in a different colour beside the original answer. The large group discussion can follow.

Another way to extend the learning value of Part II is to use it as a springboard for further research by the students.

Compost Survey – Student Pages

Part I - Read each statement and circle your response.

1. I compost at home.
never sometimes/usually always
2. I understand what composting is.
never sometimes/usually always
3. When I sort my lunch waste, I know what goes into the compost food barrel.
never sometimes/usually always
4. I know what happens to the food in the compost food barrel.
never sometimes/usually always
5. My friends are careful not to throw plastic utensils into the compost food barrel in the cafeteria.
never sometimes/usually always
6. After lunch if I have leftover food, I save it to eat later.
never sometimes/usually always
7. I sort my lunch waste carefully.
never sometimes/usually always
8. Sorting lunch waste is easy.
never sometimes/usually always
9. My friends sort their lunch waste correctly.
never sometimes/usually always
10. I notice when other kids sort their lunch waste correctly.
never sometimes/usually always
11. Sorting lunch waste takes only a few seconds.
never sometimes/usually always
12. After a while, kids get used to the routine of sorting their food waste.
never sometimes/usually always
13. The product from composting food waste, compost, can be useful.
never sometimes/usually always
14. If plastic/glass/metals accidentally land in the food waste barrel I remove it.
never sometimes/usually always
15. I check the daily composting poster if I'm unsure what to put into the food waste barrel.
never sometimes/usually always
16. I ask a teacher or student if I am unsure about what to put into the food waste barrel.
never sometimes/usually always

Part II - Decide if each of the statements is true or false. Circle your answer.

1. The nutrients in food can be recycled.
true false
2. Paper is biodegradable
true false
3. Plastic wrap should go into the compost.
true false
4. Changing food into soil takes several weeks or months.
true false
5. Soil is made out of organic material and sand.
true false
6. Worms are decomposers.
true false
7. Decomposers in a compost pile need oxygen.
true false
8. It doesn't matter if the compost pile is turned as long as it is wet.
true false
9. The product of a compost pile is similar to topsoil.
true false
10. The best way to get rid of leaves is to put them in a plastic bag for trash pick-up.
true false
11. When compost gets compacted, it can cause unpleasant odours.
true false
12. The centre of a working compost pile is very cool.
true false
13. Compost piles are always very smelly.
true false
14. Nature recycles.
true false
15. People who live in apartments can't compost.
true false
16. Composting is one way to recycle.
true false
17. Decomposers need only food and air to do their work in a compost pile.
true false
18. Yard scraps such as grass clippings and leaves can be composted.
true false
19. Composting works only if it is done in a specially designed compost bin.
true false
20. Usually, pest species are not attracted to a compost bin if meat and bones are not put into it.
true false

(Correct answers on the answer leaflet at the end of this manual page 59)



LESSON II: COMPOST INTRODUCTORY LESSONS

Grade	4 - 12
Objective	This is an introductory lesson to composting designed to encourage students to rethink the way we value our trash
Activity description	See further in the text
Materials needed	See hereunder
Key vocabulary	Trash, packaging, attitude, sorting, resources, value, composting, biodegradable, recycling, food chain, decomposing
Duration	The three parts of the lessons can be done in a 90 minute teaching block. Alternatively, Parts I and II can be taught as one lesson and Part III, which introduces composting, taught as a separate lesson. Time: 90-120 minutes, depending on age group and extent of discussions. Class of 20-25 students, divided into groups of 4.
Skills used	Observation/ classification/ motor skills/ computation

Materials:

For Part I & II

- Five grocery bags, each containing: Cereal box, soda can, another metal food container, plastic food container, old piece of foil, tea bag, a cracker (in a baggie), dry leaves or grass clippings (in a baggie), ribbon or gift bow, piece of junk mail, magazine, peanut or cocoa "can" (made of foil, cardboard and plastic), plastic shopping bag, empty container of bug spray, flea and tick powder, fertilizer, or oil-based paint.
- Five sets of index cards marked: Plastic, Metal, Paper, Household Hazardous Waste, Food and Yard Wastes, and Other
- Sheets of scrap paper

For Part III

- Bag of food scraps
 - Bag of finished compost
 - Sample ingredients for the compost pile (leaf, grass clippings, apple core, orange peel, coffee grounds)
- Begin the lesson by offering to sell a bag of valuable trash; it's special because it contains packaging from some favourite products. Play up the uniqueness of this trash and entice the students to make offers. Usually no one offers to buy the trash but there may be a student who wants to play along and offers a few cents. A student might see that there is a redeemable can and offer five cents. (Who will offer 2 € for this valuable bag of trash?) Conclude that basically most of the students are not willing to pay anything for the trash.



- Ask them why and list their answers on the board. Examples of responses: The trash is worthless, they can't use it, they don't need it. Solicit words that describe how we feel about trash: Disgusting, dirty, useless. Add these words to the list on the board.

Activity:

Part I: Sorting for Points

- Divide the students into five groups. Tell them they will be given a quick activity that involves sorting a bag of trash. Each bag contains trash items and a set of category cards. Groups will be given one point for each item correctly sorted by the material it is made of. Tell them that this will probably be easy so they will need only a few minutes to complete the task. The group members must discuss the items and agree on the placement of each item. Give each group of 4 students a bag of trash and the sorting cards. They will need about ten minutes to sort.
- When all the groups have sorted their bags, list the items on the board and review with the class how each item was sorted. For each item, check for general agreement. Students may not agree but a group might be awarded a point if it can make a reasonable justification for its choice. A group member should record the points.
- There will be quick agreement for many items so do a quick whip-around to award points. The tea bag will generate discussion because many students do not see the paper as biodegradable. If you use a tea bag with a plastic string or a staple, interesting solutions may arise. Packaging made of a composite of foil, cardboard and plastic (the type for canned nuts), is not easily recycled and, therefore, is trash.
- A certain amount of discussion and competition among groups is OK. It will make the points seen more valuable. Tally and list the scores; most groups will have similar scores at this point.

Part II: What Good is Trash?

- Now challenge the groups to earn more points by using their creativity to brainstorm a list of possible uses for each item they have sorted. Remind them that when brainstorming, all ideas are acceptable. A group member should record their ideas. Give them about 5 minutes to list ideas.
- When time is up, each group can tell the class three of their ideas. The group recorder should then count their total number of ideas and add this total to the points from the sorting activity (Part I).
- Again, different opinions and ideas will increase the value of the items of trash.

Discussion questions:

- What are some words that describe how we felt about the trash during the activity?
- Make a list of the words that describe our attitude toward the trash during the activity; compare this list with the first.
- How did our attitudes compare to the beginning of the lesson when they were offered the bag of trash for sale?
- What changed our attitudes?
- Why?
- What if each point were equal to a Euro, would that affect the activity in any way?
- What does this activity show us about how we value things?

Lead the group to these ideas:

1. We can decide if something has value.
2. Each culture has objects and materials that it values for various reasons.
3. Trash is a valuable resource. One person's trash is another person's treasure.

Part III. What's Composting?

- List the following types of trash on the board: Plastic, paper, food wastes, metal, yard/garden wastes, glass.
- On a piece of scrap paper, have each student list the types of trash in the order in which he/she thinks households produce the most.
- Have them vote to show some general reactions to the question.
- Then, compare their list to the figures listed on a diagram of a trash can indicating percentages of types of waste.

Discussion questions:

- Are the percentages close to what you predicted?
- What type of trash did you put as the largest percent? The smallest? Why?
- What surprised you? Why?

Other relevant items

- Generate a list of what happens to trash after roadside pick-up: Trash is recycled, landfilled, incinerated, composted, reused.
- Define biodegradable with the students. Have students circle the items on their list that are biodegradable.
- If something is biodegradable, it can be composted. Ask if anyone composts at home; who can explain what composting is? Discuss decomposition: rotting, decaying, breaking down of organic material (part of living things) by insects, worms, fungi and bacteria (decomposers).
- If we composted all the biodegradable trash, what percent of the trash we produce could be composted? (refer to trash can diagram: over 60%).

Nature recycles:

- Discuss how nature recycles nutrients in a food chain. Students can make up examples of food chains. Food chains begin with photosynthesis by plants. Each organism uses the energy it gets to function (grow and repair cells, reproduce, run, eat, etc.)
- Discuss the breakdown of leaves in a forest using the drawing that shows how soil is made. What causes the leaves to break down into soil? The rate of decomposition depends on conditions such as the amount of water and oxygen and the types of decomposers. (If this is to be done as a separate lesson, students can go outside and investigate leaf litter and topsoil.)
- Explain that we imitate nature when we compost, but we speed up the process by creating the conditions needed for efficient decomposition.
- Show the pictures of compost animals. Ask students to name the decomposers they recognize. The discussion about the less familiar ones such as actinomycetes will depend on how much you want to get into the various types of organisms. It is adequate for them to become aware of the general categories: fungi, bacteria, worms, insects and insect-like organisms (springtails, mites) and molluscs (snails). (This fits well into a unit on invertebrates.)
- Explain that decomposers are living organisms. Ask students to list the things all organisms need to survive: food, water, air (oxygen), shelter and space.
- Show a baggie full of food scraps and a baggie of finished compost. When we compost food scraps we need to provide the right conditions for the decomposers to live and reproduce so they change food scraps into humus. Allow students to smell and touch the compost and think of words that describe it. Completely composted food results in a crumbly, earthy-smelling product.



Ingredients for composting: Browns and greens

- Food gives us energy and nutrients (basic elements) for building and repairing cells. Decomposers need carbon for energy; dry leaves and wood chips provide energy for decomposers. They also need nitrogen to build proteins; food scraps and fresh grass clippings are high in nitrogen. A carbon/nitrogen ratio of 30:1 is ideal. The browns are also called bulking agents and are layered between the greens to keep the materials from compacting.
- A light, loose mixture allows oxygen to circulate and space for decomposers to move around.
- Water must be provided also; most food has a high water content. If a compost pile gets too wet, it will become compacted and decrease oxygen flow.
- The compost bin and materials provide shelter (some protection from predators and weather conditions) for the decomposers.

Suggestions:

- Using samples of the ingredients (or paper or plastic representations), show how to layer the browns and greens.
- Visit a working compost bin, if possible, to observe contents and measure “living conditions” (temperature).
- Hold up a bag of finished compost and ask if any of the students has ever purchased potting soil. How much would this bag cost in a store? Make the point that people will pay money for compost, so it has value. What could you use the compost for?
- Have each student write on scrap paper why it would be beneficial to compost our food and yard wastes at home or in the community. Students may think of how they could use the compost in their gardens instead of buying soil or fertilizer.

Community composting:

- Reduces the amount of trash (the “solid municipal waste stream”)
- Reduces transportation costs (for transporting waste to the land fill and goods – fertilizer, soil- to market)
- Reduces fuel used for trash transportation and shipping goods to market
- Produces humus, a useful product

Closure:

- Have students write something new that each of them learned about compost or how their attitude about garbage has changed. Students can share their statements.

LESSON III: COMPOST EXHIBITS

Grade	4 - 12
Objective	This set of lessons was originally designed for teachers to use with their advisor/advisee classes as part of their environmental awareness goal.
Activity description	The students learn about composting by participating in the lesson and designing a compost display. Students translate the composting concepts into a meaningful exhibit and especially like the idea of teaching other students. Upon completion, the exhibit might be displayed in the school library, cafeteria, or at the school science fair. The exhibit could be made available on a sign-out basis for individual homerooms or for subject area teachers to display for a week to integrate composting into their curriculum. An extension activity could be for sixth-graders to visit the elementary schools with their exhibit.
Materials needed	See each (sub)lesson
Key vocabulary	See each (sub)lesson
Duration	30 to 45 minutes per (sub)lesson
Skills used	Observation/ classification/ motor skills

Constructing Traveling Displays

Each lesson contains a curriculum resource, lesson concept and summary, and ideas for designing a display board with students. Presented as a traveling exhibit, the display boards get viewers to think about ideas ranging from recycling resources to decomposition. The actual designing and building of the display may be done by the entire class or by a small group of students.

Of course, teachers may choose to do only a few of the lessons, selecting and modifying to suit their needs. The lessons can be adapted for all middle school grades.

The goal is to engage students in creating a series of interactive display boards that help other students learn concepts about composting and recycling.

- **Concepts:** Students do an activity that helps them learn about a composting/recycling concept. Each of the following lessons focuses on one theme about recycling or composting (although several concepts may be discussed); most concepts are probably not new to the students and can be done in a 30 – 45 minute block.
- **Resources:** Diagrams can be made from the internet and several encyclopaedia.
- **Display idea:** Students design and build a display about that theme. Using the ideas presented in the lesson, students either design the display together or follow instructions for a teacher-designed display, with student input. The time required for the construction of the display will vary, depending on the group. An idea for building the display board around the compost or recycling themes follows each lesson. The display board should be instructive, interesting and interactive, focusing on one main concept. The display should have a title or question clearly printed and displayed. Using actual items and three-dimensional depictions whenever possible will make the display more attractive and



interesting to viewers. Instructions should be clearly printed to explain how viewers are expected to interact with the display and how the display items should be left for the next user. Other things to consider: materials, simplicity, durability, time for construction.

PART 1: ROT TIME

How long would it take for various items to decompose if thrown outside onto the ground?

- Concepts: The amount of time it takes for an item to break down depends on the material of which it is made; if items are not disposed of properly or recycled, many items will not break down in our lifetime; the consequences would be a more unpleasant and/or dangerous environment, and already limited natural resources would be wasted.
- Vocabulary: Decomposition, biodegradable.
- Resources: “Enduring Litter” charts on the internet illustrate estimated years for decomposition of various items.
- Lesson summary: Students estimate decomposition time for items as they put actual items (or pictures, or labels) in the order in which they predict each would decompose; discuss the concepts (decomposition, biodegradable, recycling).
- Display idea: Students bring in actual items and place them in a box. Items are placed on hooks on the display board adjacent to the appropriate years (rot time).

PART 2: TRASH STATISTICS

What are the various types and percentages of wastes we throw away?

How much do we recycle?

- Concepts: The municipal solid waste stream can be categorized into paper, yard/garden wastes, food, plastic, glass, metal and other; paper is the waste we produce in the largest percentage; we either burn, landfill, compost, reuse or recycle our garden and food waste can be composted; three benefits of composting are less pollution, recycling plant nutrients, and production of compost.
- Vocabulary: Municipal solid waste stream, composting, resource recovery facility
- Resources: The trash can diagram, mentioned earlier.
- Lesson summary: Students examine the waste bag content, categorize and make predictions (in percentages) for amount of each type of trash produced in their school/country; they can also predict which categories are the highest percentages, lowest, etc. and give their reasons; discuss which items should be recycled; discuss other concepts (above); a sample of typical daily household waste could be brought in by the teacher; a classroom trash can be examined as a comparison.
- Display idea: Provide a box of items to be sorted by categories into labelled, mini-trash containers, with appropriate label (plastic, metal, paper, glass, others); the display board could have a re-creation of the garbage bag diagram with examples of real items; the viewer would hang the appropriate percentage sign on the garbage bag.

PART 3: INTRODUCTION TO COMPOSTING

What is composting? Why compost?

- Concepts: Decomposition is the process of living organisms digesting and reducing organic material into humus; in nature, soil is created when decomposers digest dead plants and animals, recycling important nutrients (the nutrient cycle); in composting, we create an environment suitable for organisms to flourish and reproduce, causing organic materials to decompose faster; yard trimmings, food waste and paper (a large percentage of our waste stream) can be recycled through the composting process; there are many benefits to composting.
- Vocabulary: Composting, compost, biodegradable, waste stream, nutrients.
- Resources: “Composting,” in part II of this manual.

- Lesson Summary: Students examine composition of soil and/or compost material and discuss how nature makes soil; students discuss composting, how it is done, role of decomposers; students make decisions about which parts of our waste stream could be composted (sort trash samples, use diagram, or word cards); discuss the benefits of composting.
- Display Idea: “Composting at Our School,” - informational diagrams and labels which focus on the school composting system; take digital photos of the school process, download and print and use as a sequencing activity; include a sorting activity which has viewers separate out items (real or simulated) that can be composted in the school composting bin.

PART 4: COMPOST CREATURES

What are the important organisms that do the work of decomposition in a compost pile?

- Concepts: Decomposers are the organisms that break down foods into their basic nutrients (e.g. calcium, potassium, nitrogen, carbon) that can then be reused by plants and continue the nutrient cycle; insects, worms, fungi and bacteria decompose the food by physical activity (chewing, shredding) and chemical activities (digestion).
- Vocabulary: Decomposers, decomposition, biodegradable, nutrient cycle.
- Resources: Search for “Compost Animal” on the internet.
- Lesson summary: Students search for organisms in compost material, identify, sketch and read about; discuss concepts (above); students may search with the naked eye, a hand loupe or by sorting through a sample of compost material with the aid of a dissecting scope.
- Display idea: Diagram or create a compost pile with real and simulated materials; student drawn pictures of decomposers are arranged throughout the pile; decomposer pictures are flipped up to reveal an information card about the organism; display could play on the idea of “most wanted” posters for a compost pile; students may think of their own title.

PART 5: CONSTRUCT A COMPOST PILE

What are the parts of a compost pile? What keeps a compost pile cooking?

- Concepts: Decomposers are organisms (fungi, worms, insects, bacteria) that digest food/yard waste, turning it into a rich soil; the decomposers must be given the correct conditions for the composting process to work quickly (water, oxygen, food, and mass); dead leaves, wood shavings, straw or shredded paper (referred to as “browns”) provide carbohydrates for energy and spaces for oxygen to circulate; nutrients such as food scraps or grass clippings (referred to as “greens”) provide the protein necessary for cellular growth and reproduction.
- Vocabulary: Decomposers, browns, greens.
- Resources: Search for “Compost Animal” on the internet; “Composting” in part II of this manual.
- Lesson summary: students view video and/or visit our school composting boxes; discuss concepts (above).
- Display idea: Students construct artificial layers to fit onto a compost box diagram (browns are represented by 24” x 6” pieces of foam core board covered with paper leaves or dried leaves glued on; greens are foam core board with paper food scraps or magazine pictures of food). Exhibit viewers must read a paragraph about constructing a compost pile, then hook the brown and green layers on the exhibit board. Situation cards are printed that describe conditions in the compost pile requiring the exhibit viewer to select a remedy card; a reference chart about compost troubleshooting is also displayed. Figure out a clever way to let the viewer know the selected remedy is the correct one.



PART 6: COOL FACTS ABOUT COMPOST

What are some interesting facts about composting? What's happening with our school compost?

- Concepts: Decomposition is the process through which living organisms digest and reduce organic material to humus; in nature, soil is created when decomposers digest dead plants and animals, recycling important nutrients (the nutrient cycle); in composting, we create an environment suitable for organisms to flourish and reproduce, causing organic materials to decompose faster; yard trimmings, food wastes and paper (a large percentage of our waste stream) can be recycled through the composting process; there are many benefits to composting.
- Vocabulary: Composting, compost, biodegradable, waste stream, nutrients.
- Resources: "Trash bag diagrams" on the internet, in documents to copy; copy of the school composting records showing amount of food composted.
- Lesson summary: Students discuss composting at their school, what is composted, the benefits of composting, tour the school's compost bins, search for interesting facts about composting.
- Display area: Create a "Cool Facts about Composting" display using foods and decomposers as cartoons characters who ask questions or give hints; viewer must flip up a card or open a lid to read the answer or cool fact.

LESSON IV: COMPOST LABS

Grade	5 - 12
Objective	Investigate the processes in a active compost box
Activity description	Four hands-on compost labs examining different varieties of compost (micro) organisms well as different kind of soils.
Materials needed	See table hereunder
Key vocabulary	Red wigglers (compost worms), fungi, compost food web, soils, odor, texture
Duration	60 - 90 minutes
Skills used	Observation/ classification/ motor skills

A lab can be done with a whole class; alternatively, they can be set up as lab stations through which small groups of students rotate.

Lab Title	Description	Concept	Teacher preparation	Materials
Lab I – Fungi	Examine variety and structure of fungi samples	Fungi are important decomposers	Grow samples of fungi from compost “Compost Animals” on the internet	Petri dishes Hand lenses or dissecting scopes
Lab II – Animal Decomposers	Examine variety of animal decomposers	A variety of animals make up a compost food web	Select samples of compost containing compost animals; “Compost Animals” on the internet; keep in small covered containers	Compost animals Compost food web diagram Petri dishes Hand lenses or dissecting scopes Probes/toothpicks
Lab III – Red wigglers	Examine compost worms	Red wigglers decompose food in a worm bin	Start a class worm bin (or have access to an active worm bin)	Red wigglers Worm bin Petri dishes Hand lenses or dissecting scopes
Lab IV – Soil composition	Examine different types of soils; compare to compost	Organic materials are an important ingredient in soils	Collect samples of field and forest soil; unscreened and screened compost	Soil samples Petri dishes Hand lenses or dissecting scopes



PART 1: FUNGI DECOMPOSERS – STUDENT LAB SHEET

Question

What are some of the first organisms that begin to decompose food scraps in a compost pile?

.....

Hypothesis

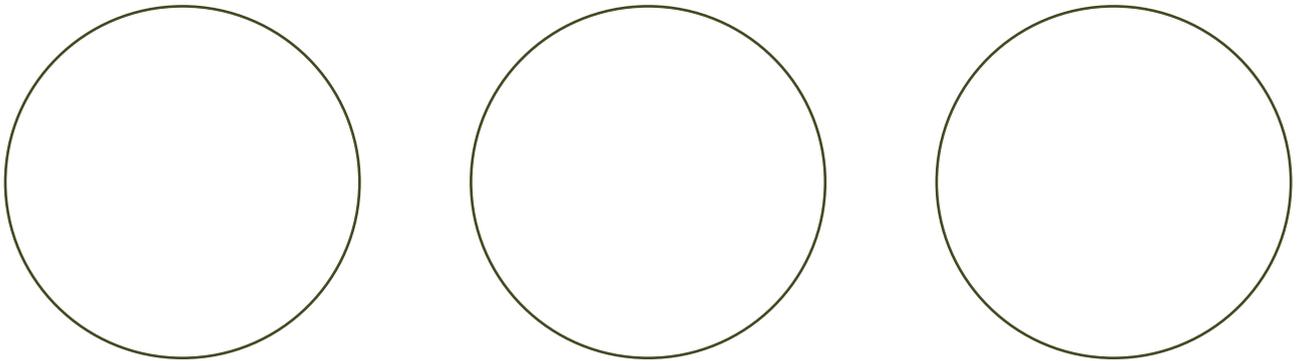
What do you think?

.....

Procedure

It takes many types of organisms to decompose food scraps in a compost pile. The food must be physically and chemically broken down. Observe the petri dishes of fungi samples under the dissecting microscope. In the circles below, sketch each type you observe.

Observations:



Write a description of the fungi:

.....

About Fungi:

Fungi cannot photosynthesize; instead, they get their energy and nutrients from dead and dying organisms. Many kinds of fungi grow in a compost pile; some are commonly called mould. As a fungus grows, it branches out and burrows through the food scraps, breaking it up into smaller pieces. The fungus releases chemicals that soften the food scraps and make it easier for the fungi to extract the nutrients it needs.

The changes in the food scraps made by the fungus as it grows and feeds, make it easier for other compost organisms to feed. Smaller and softer food scraps are easier for fungi, bacteria and other decomposers to feed on.

The fungi are also part of a food web in a compost pile. Look at the diagram of compost organisms (documents to copy) to identify three types of animals that feed on fungi. (The arrows in the diagram indicate the flow of energy and nutrients along the food chain.)

Conclusion:

What do you think would happen if all of the fungi in a compost pile died?

.....

PART 2: ANIMAL DECOMPOSERS – STUDENT LAB SHEET

Question

What are some of the animal decomposers that work in a compost pile?

.....

Hypothesis

What do you think?

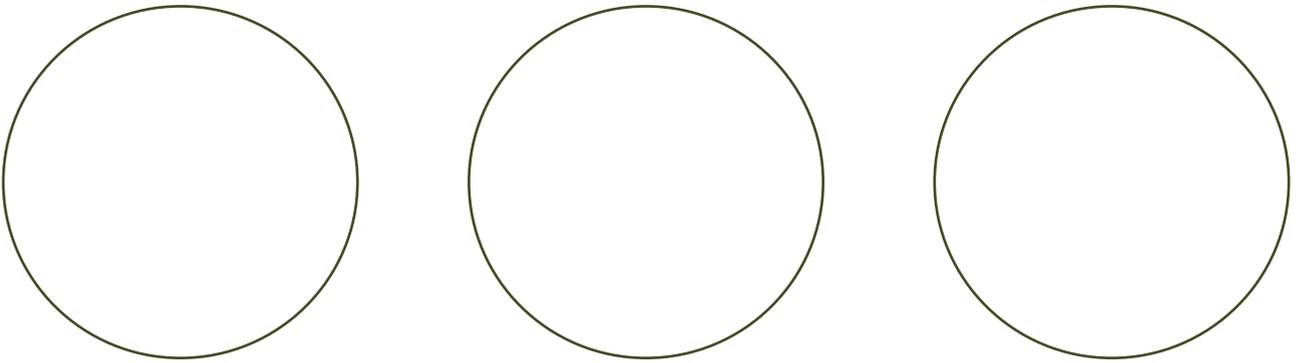
.....

Procedure

Take a small sample of compost material from the tub and place it in a petri dish. Using a toothpick to gently probe through the mixture, look for tiny organisms. Use a hand lens or dissecting microscope to get a closer look.

Observations

Sketch in the circles below some organisms you find in the circles below.



After you sketch, try to identify the type of organism by referring to the compost food web diagram.

.....

Write where each organism fits into the food web. Does it feed directly on the food scraps or does it feed in the second or third level of the web?

.....

About decomposers:

When animal decomposers burrow into food, they shred the food, pull it apart and chew it. During digestion, food bits are chemically broken down into simpler nutrients by the digestive juices. Each animal takes the nutrients it needs from its food and excretes what it doesn't need. In the compost pile, the dark, nutritious soil made from animal wastes is called compost.

Conclusion:

Why do you think it's important to have a variety of decomposers in the compost pile?

.....



PART 3: RED WIGGLERS – STUDENT LAB SHEET

Question

How do worms make soil in a worm bin?

.....

Hypothesis

What do you think the worms are doing in the worm bin?

.....

Procedure

Describe what you see in the worm bin:

.....

Carefully remove a small sample of shredded paper and a red wiggler worm from the worm bin and place them in a tray. Take a few minutes to observe the behaviour and structure of the worm. You are removing the worm from its home. You may notice some behaviour's that indicate that it may be uncomfortable in the tray. Be gentle with the organism; in a few minutes, return it to the worm bin and cover it with some of the paper.

Sketch the worm:

.....

Write three things you notice about its behaviour:

.....

About the worm bin:

The worms used in a worm bin are red wigglers, a relative of the common earthworm. Red wigglers feed directly on food scraps, which makes them great for composting. Given the right conditions of moisture (they breathe through their skin), oxygen, and food scraps, red wigglers are very efficient decomposers. Their digestive systems break down the food physically and chemically. Their wastes, called worm castings, make soil dark and rich in nutrients.

Conclusion:

Why would it be important to have a lot of worms in your garden?

.....

PART 4: SOIL COMPOSITION - STUDENT LAB SHEET

Question

What are the ingredients in soil?

.....

Hypothesis

If you had to write a recipe for soil, what would be the ingredients?

.....

Procedure

Compare the soil samples and write your observations in the chart. (labelled soil samples: field soil, forest soil, unscreened compost and screened compost.)

Field soil	Color	Odor	Texture	Ingredients
Forest soil				
Unscreened compost				
Screened compost				

If you had more time, what would be some other ways to compare the soil samples?

.....

About soil

The formation of soil is the result of three processes, mechanical decomposition, chemical decomposition and the activities of soil organisms. Mechanical decomposition happens when the freezing and thawing of water break down rock material into smaller and smaller pieces. Rainwater dissolving calcium salts from rock material is an example of chemical decomposition..

A layer of rich, dark soil, called topsoil or humus, is found in forests and fields. There, dead plant material is decomposed in the digestive system of soil organisms, such as earthworms. Their wastes are the recycled nutrients needed for new plant growth and are the main ingredient in humus. Depending on weather conditions, it could take many years to form one inch of topsoil.

In the forests and fields, nature recycles nutrients all the time. When people compost food scraps, they are copying nature, but we speed up the soil-making process by giving the decomposers the right conditions for them to grow and reproduce quickly. The decomposers need nutrients (to form proteins for cell structures), energy, water, and oxygen. Fresh food scraps supply the nutrients; dry leaves or wood chips supply the energy. Turning the pile regularly provides spaces for oxygen to circulate. The compost pile should be kept moist, but not dripping wet. Given the right conditions, the decomposers can change more food scraps into compost.

Conclusion:

How did the soil samples compare? What were some of the surprising or most interesting observations you made?

.....



LESSON V: COMPOST TOUR

Grade	4 - 12
Objective	This activity is designed to be used after the school composting program is underway to help students learn more about their school composting process.
Activity description	See hereunder
Materials needed	See hereunder
Key vocabulary	Food barrels, food scrap, vegetables, fruit, temperature, fungi, bacteria, worms, compost
Duration	60- 90 minutes
Skills used	Observation/ measurement/ motor skills/ classification

PART 1: BEFORE THE TOUR

Students show what they already know about the school composting program. It is interesting to see what preconceived ideas students have about composting.

Students should respond to questions in Part I individually; if there is time, they may discuss their answers in a small group or as a class. Part I could also be a homework assignment the night before the Compost Tour. Students could be encouraged to get family members responses after they have completed their answers to Part I.

Questions:

- What is composting?
- Where are the school's composting bins located?
- What types of foods should be put in our compost pile?
- Name some cafeteria wastes that do not belong in compost:
- List two other things you're likely to find in a bin as part of the compost process:
- List three locations in the school where we could collect food wastes:
- List the steps for composting food:
- What actually decomposes the food in a compost pile?
- What is the end product of the composting process?
- List any general beliefs or ideas you have about composting:
- What are the benefits of composting?
- Predict:
 - o The weight of food wastes per day at our school: _____ kg.
 - o The total weight of food wastes in the compost pile so far this school year: _____ kg.
 - o The temperature of the compost pile: _____ °C



PART 2: TAKE A TOUR OF THE COMPOST BOXES

Materials:

1. Clipboards and student worksheets: One per student

Answer the following questions during the tour:

- How many boxes are there?
- Which box has the oldest contents?
- Why do we have three boxes?
- What are some of the problems we've had with the composting piles?
- List the items you recognize in box #1:
- Which box is the hottest? Why?
- Name some of the decomposers:
- Why are woodchips or dry leaves added to the pile daily?
- Name two other things needed by the decomposers, besides energy and nutrients:

2. Equipment (used for daily composting operation): Cafeteria food barrels, food scraps in barrel, scale, weight chart, compost thermometer.

3. Food Cards (one food written on each card): Salad, cheese, milk carton, sausage, carrots, chicken, apple, pasta, bread, cookies, vegetable soup, waffles and syrup, cereal.

4. Compost Sequence Cards: Each step in the sequence should be printed on large paper.

1. Lunch wastes are sorted
2. Food scraps are weighed; weight is recorded on chart
3. Temperature of active bin is measured and recorded
4. Food scraps are placed in the bin
5. Dry leaves, wood shavings or wood chips are spread over the food scraps
6. Fungi, bacteria, worms and insects decompose the food
7. When bin is full, pile is moved over into the next bin

Setting up the tour:

Talk up the tour as an adventure, perhaps wearing a sign that says "Tour Guide". Be enthusiastic and ham it up! Get the students involved in the tour. It should be fun, informative and interactive. Students should have their worksheets on a clipboard. For younger kids, you could assign a few students the role of inspectors.

Touring the group through the composting process:

1. **Station 1:** Food waste barrel in the cafeteria. Student involvement: Distribute Food Cards and have students take turns placing cards in front of the correct barrel to show they know how to sort their lunch wastes.
2. **Station 2:** Scale (wheel the barrel to the scale to weigh and record, a job for the "inspectors"). Student involvement: Students predict weight of food wastes, "inspector" records weight on chart.
3. **Station 3:** The school compost bins. Explain purpose of the three bins and the steps of the composting operation, from food-sorting in the cafeteria to turning the pile into the adjacent bin.

Student involvement:

- Measure and record the temperature of the three bins
- Review the composting operation sequence: Seven students who are holding a sequence card arrange the composting steps in the correct sequence
- Take turns shovelling (turning over) the contents from bin #1 to #2
- Compare contents of three bins

PART 3: AFTER THE TOUR

Students return to the classroom to respond to questions on student sheet, based on information gained on the tour.

Questions:

- What surprised you about the compost?
- What is some new information about compost that you learned from this tour?
- What could be done with the compost produced from the food wastes?
- Where did our food wastes go before we composted? Are there any problems with that?

For further thought:

- We all produce the food wastes in the school. Make some suggestions for sharing the responsibility for the composting operation.
- Think of a catchy phrase or jingle to get kids to sort their food correctly or get involved in composting.
- Respond to the following statement:
- Without decomposers, we could not exist.

Class discussion:

- Responses on student sheet, the benefits of composting, and how students can volunteer to help out with the daily composting operation.



LESSON VI: WHAT'S FOOD SCRAP!

Which of these should be put into the school compost bin? Circle your answers.

Vegetable scraps

Orange rinds

Meat

Fish

Fat

Egg

Nut shells

Bones

Stalks, stems and vines

Leaves

Chicken

Dairy products

Vegetable oils

Apple core

Plastic

Pasta

Coffee grounds

Peanut butter

Tea bag

Beans

Bread

(Correct answers on the answer leaflet at the end of this manual page 59)



LESSON VII: COMPOSTING QUIZ

Grade	All grades
Objective	Test your knowledge about composting
Activity description	Working individually or in small groups, complete this short composting quiz. This activity can be done before (pre-test) and after (post-test) a lesson/ activity on composting. The results can be discussed in group.
Materials needed	Copies of the quiz card
Key vocabulary	Compost, worms, micro-organism
Duration	2 x 15 minutes

1. What is the best way to deal with our rubbish?

- Re-use it
- Recycle it
- Reduce it
- Throw it in the bin

2. What is compost?

- Mud
- Dark brown soil-like material
- A type of plant
- A cake filling

3. Why should we make compost?

- Because it gives us a healthy appetite
- Because it helps us watch TV
- Because it is bad for the environment
- because kitchen and garden waste is a valuable resource that can be transformed into a useful usable soil improver

4. Where do worms and other micro-organisms like to live?

- In the fridge
- Down the drain
- In your lunch box
- In a compost bin

5. Which of the following should you NOT put in your compost heap?

- Kitchen waste
- Metal
- Nettles
- Grass



6. Why should you not put meat and fish in your compost heap?

- They don't rot
- They smell
- They might attract vermin e.g. rats
- They are inorganic

7. What percentage of the average dustbin of rubbish can be composted?

- 10%
- 25%
- 50%
- 100%

8. Where can we use compost once it's ready?

- In the garden or vegetable patch
- In the kitchen
- On the road
- In the landfill site

9. How long does it take before the compost is ready?

- 24 hours
- Six weeks
- Six to nine months
- Two years

10. Which of the following is not a composting creature?

- Beetle
- Worm
- Snake
- Earwig

11. What is the greenhouse gas produced at the landfill sites?

- Oxygen
- Helium
- Methane
- Carbon monoxide

12. Which of the following organisms DON'T help the rotting process?

- Bacteria
- Fungi
- Worms
- Shell fish

(Correct answers on the answer leaflet at the end of this manual page 59)

Lesson I: Compost survey: Part II

Answers: True statements: 1, 2, 4, 6, 7, 9, 11, 14, 16, 18, 20
False statements: 3, 5, 8, 10, 12, 13, 15, 17, 19

Lesson II: Compost introductory lessons: Part I: Sorting for Points

Answers:

- Paper – cereal box, junk mail, magazine
- Plastic – plastic food container, lid of peanut can, plastic shopping bag
- Metal – soda can, metal food container, foil,
- Food and Yard Wastes – cracker, dry leaves, grass clippings, tea bag
- Household Hazardous Waste – empty container of bug spray, flea and tick powder, fertilizer, oil-based paint
- Other – peanut or cocoa can, ribbon, gift bow

Lesson VI: what's food scrap!

Answers: vegetable scraps, orange rinds, egg, nut shells, stalks, stems, vines, wood ashes, leaves, apple core, coffee grounds, pasta, tea bag, bread, beans

Lesson VII: Composting quiz

Answers: reduce it, dark brown soil-like material, because it reduces the waste going to the landfill, in a compost bin, metal, they might attract vermin e.g. rats, 50%, in the garden or vegetable patch, six to nine months, snake, methane, shell fish





Getting more out of the organic cycle

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