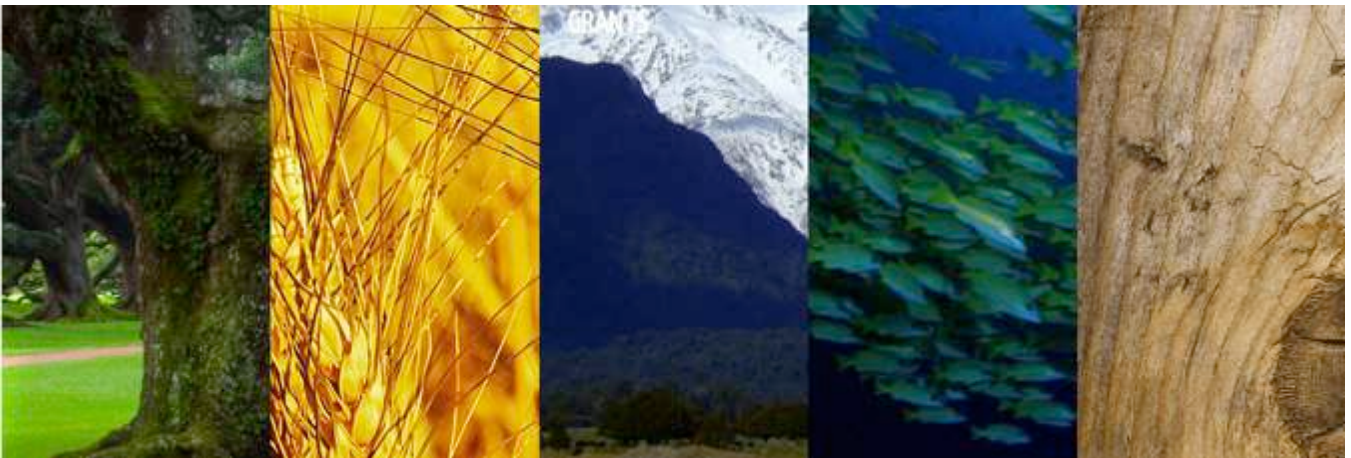


Living Walls in the Classroom



Project Curriculum Guide for Educators

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Table of Contents

Acknowledgements	Page 3
The Silverhill Institute: Background and History	Page 4
Living Wall Benefits	Page 4
Program Overview and Objectives	Page 5
Connections to Ontario EcoSchools	Page 6
Program Benefits	Page 6
Living Wall Design & Project Pictures	Page 7
Appendix	Page 11
Session One – <i>Program Introduction</i>	Page 12
Session Two - <i>Living Walls</i>	Page 20
Session Three - <i>Wall Designs</i>	Page 29
Session Four - <i>Painting the Wall</i>	Page 33
Work plan	Page 36



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Silverhill also wishes to thank two Home Depot stores (Store 7013 at 2121 St. Clair Ave. W. Toronto, and Store 7011 at 193 N. Queen St. Etobicoke) for their generous contributions including the supplies to construct the wall as well as some of the plants for the wall. We would also like to thank Sheridan Nurseries (2827 Yonge Street Toronto) for their plant donations.

Finally Silverhill would like to recognize and thank the Principal David Crichton, and the teaching staff and students at Rose Avenue Junior Public School for engaging in this project to build a Living Wall.

It is the hope of all the people involved in this Living Wall project that this report, the curriculum materials and the steps provided for planning, assembling and managing the Living Wall will encourage other schools to undertake similar projects.

Peter Homenuck PhD, RPP. (Chair)
Silverhill Board of Directors



The Silverhill Institute: Background and History

The Silverhill Institute is a charitable foundation established in 2004 with the aim of providing balanced, reliable, and evidence-based information to individuals and organizations. We support and carry out research on current environmental issues, and focus on applied research and education projects that benefit communities and their residents.

The Institute's commitment to environmental education has been demonstrated through the Silverhill Graduate Research Grant program, which has supported, to date, thirty Canadian graduate students engaged in environment-focused and applied research projects. Since the founding of the organization in 2004, we have continued our internship program, which provides placement opportunities to graduate students to work on research and planning projects. The objective of the program is for students to gain professional skills, while often simultaneously receiving course credit towards their graduate degrees.

This year, we are focusing our energy and resources on environmental education projects for elementary and high school students. With the support of several donors and numerous volunteer hours, we initiated our pilot *Living Walls in the Classroom* project in Toronto's Rose Avenue Junior Public School in February 2014.

This document outlines the curriculum for the *Living Walls in the Classroom* project, and also contains information and ideas that were gained during the project's implementation. It is our hope that you and your organization will be able to use this curriculum to implement a similar living wall project in your own school, business, or community.

To contact the Silverhill Institute, and for more information about this and other projects, please visit us at www.silverhillinstitute.ca.

Living Wall Benefits

The construction of living walls in classrooms and in office buildings provides many positive health benefits. Headaches, fatigue, dizziness, nausea, allergies, skin irritation and dryness are just some of the serious health impacts from poor indoor air quality. When people experience these acute symptoms associated with poor indoor air quality, health authorities refer to their condition as Sick Building Syndrome (SBS). The Canadian Centre for Occupational Health and Safety has identified numerous pollutants affecting indoor air quality such as CO₂, dust, fungi, moulds, bacteria, ozone, and volatile organic compounds (VOCs) including formaldehyde. There are traditional strategies to improve indoor air quality such as adequate ventilation and the removal of materials causing pollution. However, living (green) walls represents a new and innovative strategy to provide healthier indoor air.



Living walls are vertically constructed gardens that can be easily and affordably installed indoors. Selecting an appropriate mix of plants for the living wall will bring significant health and environmental benefits. Acting as a bio-filter, the plants in the living wall absorb VOCs while reducing levels of carbon dioxide (CO₂) and carbon monoxide (CO). An earlier Silverhill Institute report identified numerous plants capable of reducing levels of formaldehyde, benzene, hexane, and trichloroethylene. Some of these plants will be discussed in more detail in this report.

In addition to removing dangerous air pollutants, living walls have been shown to reduce heating and cooling costs while creating quieter working spaces. There is little doubt that living walls can make an attractive and practical addition to any building regardless of the complexity of their design.

Our *Living Walls in the Classroom* project demonstrates that building living walls in schools can also offer many fun and interactive opportunities for students to learn about their built environment, environmental careers, plants and cultures.

Program Overview and Objectives

The *Living Walls in Classroom* pilot project was completed in five sessions at the Rose Avenue Public School between February and May 2014. The first two sessions focused on environmental education, plants and careers, and the remaining sessions focused on hands-on workshops (including the painting and building of the living wall). It is important to note that the program was designed for Grade 5 students. However, please feel free to change the format of the program based on time availability and intended audience. We are confident that students of all ages can benefit from the implementation of this Living Walls project in their school.

The *Living Walls in Classroom* project has four main objectives:

1. Provide in-class educational sessions focusing on the connections between indoor air pollution and plants, with a practical focus on living walls, edible plants, environmental careers, and sustainability.
2. Provide in-class, hands-on workshops teaching students how to plant and build their own living wall in the classroom.
3. Offer continuous in-school monitoring ensuring that the living wall remains thriving and healthy.
4. Engage elementary students to provide them with opportunities to improve their environments and their communities.



Connections to Ontario EcoSchools

The pilot ‘Living Walls in the Classroom’ program was completed in Rose Avenue Junior Public School, successfully certified as a Platinum EcoSchool. Since Rose Avenue has been such an active participant in the EcoSchools program, the Silverhill Institute specifically designed our Living Walls program to complement and support the EcoSchools initiative. We believe our program will be extremely useful to schools looking to become certified EcoSchools, in addition to those already certified.

The EcoSchools program requires that schools achieve points for successful environmental initiatives in numerous categories including Curriculum, and Environmental Stewardship.¹ The curriculum category requires that environmental lessons occur over at least two academic periods, while also including student assignments – the Silverhill Living Walls curriculum meets all of these requirements. Our program can also support the Environmental Stewardship category, by reinforcing environmental learning alongside a focus on engaging students throughout the program.

Beyond the EcoSchools component of our program, we have considered the unique maintenance requirements of a living wall located in a school, where students and most staff are absent during summer break. Our program emphasizes plants, such as aloe vera, that require extremely limited maintenance and water. We also offer schools the opportunity to remove the plant pots from the living wall during the summer and place them in outdoor school gardens where they receive natural sunlight and rain. These plants are then easily moved back to the wall in September.

Program Benefits

Since living walls can be safely and affordably constructed, they represent an ideal opportunity to engage students of all ages in environmental education. The Ontario Government has made a clear commitment to embedding environmental education in all grades and in all subjects, stating “by the end of Grade 12, students will acquire knowledge, skills, and perspectives that foster understanding of their fundamental connections to each other, to the world around them, and to all living things.”²

Our Living Walls program can assist teachers in meeting the curriculum requirements for their classroom by providing lessons on air quality, human health, and the unique properties of plants that allow them to filter indoor air. We also believe that this curriculum will be relevant to

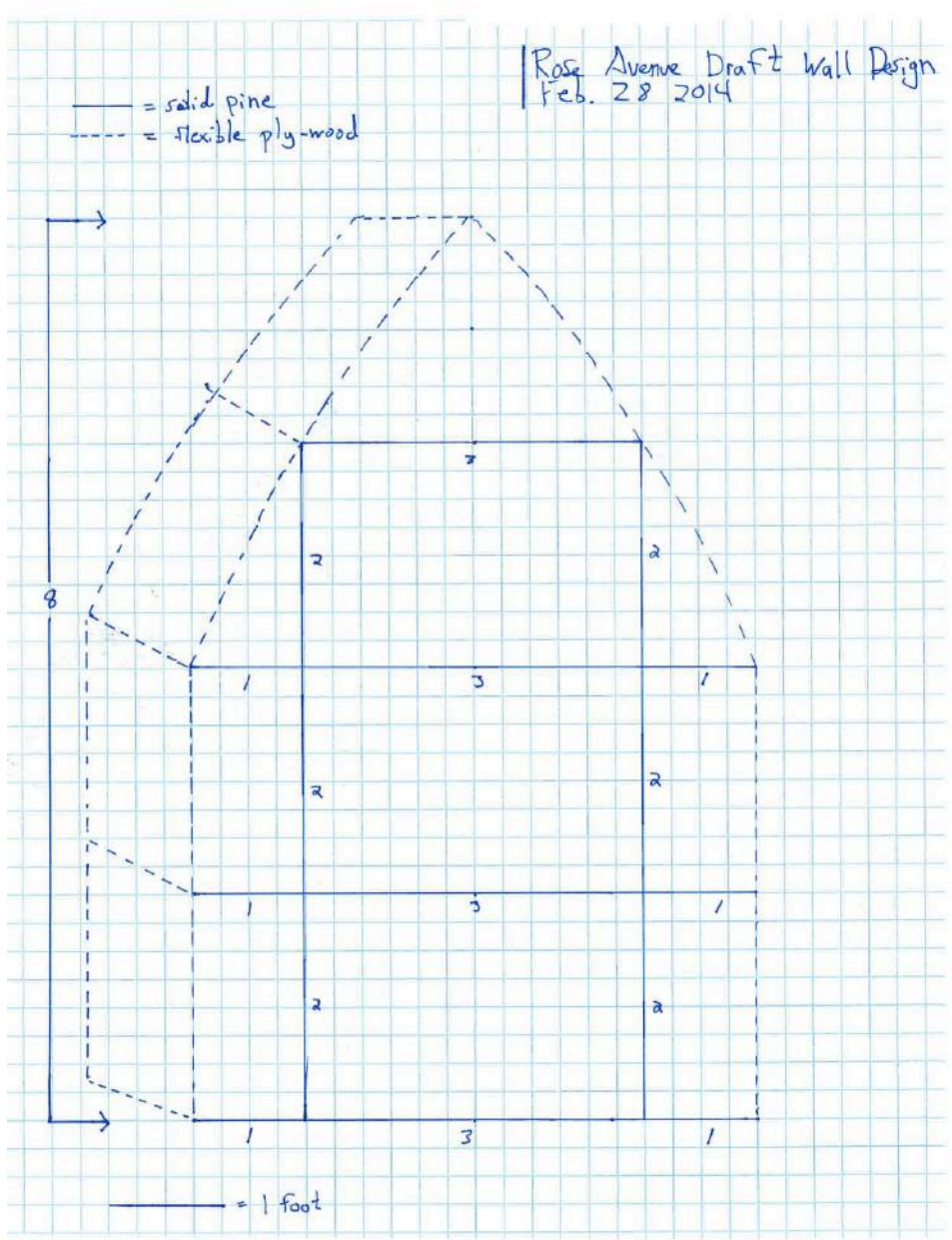
¹ Ontario EcoSchools, “Certification Guide 2013-2014.” Retrieved from http://ontarioecoschools.org/become_an_ecoschool/downloads/Certification_Guide_2013-14.pdf.

² Government of Ontario, “Environmental Education: Scope and Sequence of Expectations, 2011 Edition,” Retrieved from <http://www.edu.gov.on.ca/eng/curriculum/elementary/enviro18curr.pdf>, pg. 3.



those implementing environmental education and sustainability programs in non-academic settings.

By making all course materials and curriculum freely available to participating institutions and online, this program has potential to impact numerous students and educational institutions.











Appendix

- *Session 1: Program Introduction*
- *Session 2: Living Walls*
- *Session 3: Wall Designs*
- *Session 4: Painting the Wall*
- *Sample Work Plan*



Session 1

**By the end of this session,
participants will:**

- **Understand the difference between balanced and unbalanced research**
- **Be able to define the natural and built environment**
- **Be aware of different industries within the environmental sector**
- **Learn about different careers in the environment, and the required education**
- **Know what a living wall is, and the factors to consider when building one**
- **Understand the connections between plants and air quality**
- **Learn characteristics of specific plants**



1. Understanding the importance of objective research:

Key issues:

- What does a research institute do?
- What is the value of objective research?

Curriculum material:

- **Research** is the organized search for knowledge, and for new ways to use this knowledge.
- **Balanced research** requires carefully looking at all opinions on an issue, and not just the ones we may personally agree with or initially think to be right.
- A lot of our work involves looking for new information that answers questions about the environment, and suggesting ways to use this new information.
- As an example, our group has researched information on plants and air quality, and we are going to apply this knowledge by sharing it with you!

Discussion Question: What do you think is the difference between good and bad research? Can you provide an example of bad versus good research?

2. Examining definitions of the environment:

Key issues:

- Defining the natural and built environments

Curriculum material:

Discussion Question: When you hear the word “environment”, what do you think about first? Forests? Lakes? Mountains? Cities?

Many people view the environment as things outside, including forests, parks, and oceans. This is true, but the **natural environment** includes even more things than that. *The natural environment can be defined as all things living or non-living that occur naturally on Earth – so we clearly have a very broad definition.*

Does your school fall into the category of the natural environment? Clearly it does not, as it was constructed by people. We can instead classify things like this school as part of the **built environment that is defined as any human-made surroundings that can include buildings, parks, roads, and many more things.**

Discussion Question: What are some examples of the built environment?



3. Defining the environmental sector:

Key issues:

- What areas are generally included in the environmental sector?
- How can we differentiate between these sectors?

Curriculum material:

The **environmental sector** includes both the natural and built environments. Thus, the environmental sector includes all living and non-living things on Earth, and all things created by humans.

The environmental sector can include the following components³:

- Businesses or organizations that protect the environment
 - Water protection and treatment
 - Waste management
 - Air treatment or filtration
- Businesses or organizations focused on resource management
 - Mining
 - Forestry
 - Fisheries
 - Farming
- Some others
 - Environmental policy and legislation (laws, rules, and regulations)
 - Environmental charities (like Silverhill Institute)
 - Environmental and outdoor education schools and centers

Discussion Question: What other things can be included in the environmental sector? Why can it be hard to define the environmental sector?

4. What kind of work is environmental work?

Key issues:

- How can we define environmental work?

Curriculum material:

³ ECO Canada Environmental Careers Organization, "Canadian Environmental Sector Trends, Labour Market Study 2010". Retrieved from <http://www.eco.ca/pdf/Canadian-Environmental-Sector-Trends-2010.pdf>.



Environmental work is a broad term that refers to jobs that are in the environmental sector⁴.

Discussion Question: What are some examples of environmental work?

- *Government employees* - helping to make decisions about environmental laws and regulations.
- *Environmental business* - working for a company that sells something that can help the environment, or working for any company and helping to make them more environmentally friendly.
- *Industry* - Mining and forestry employees
- *Environmental technicians* - can include taking and analyzing water, soil, or air samples
- *Farming and fishing* - employees involved in harvesting food
- *Environmental consulting* - helping other businesses or organizations make smart choices about how their business impacts the environment
- *Environmental charities and education*
- And many more!

5. What education do you need?

Key issues:

- What educational paths can lead to environmental work?

Curriculum material:

Because there are so many types of environmental jobs, the education needed is also very broad!

Discussion Question: What classes are you taking now that provide you with environmental sector skills?

In the future, you can focus on the following:

1. High school:

Natural sciences:

- Biology
- Chemistry
- Physics

⁴ *ibid.*



- Geography

Environmental policy and/or planning:

- Political science
- Social Science
- Geography
- Business

Skilled trades:

- Shop/carpentry class

2. Post-secondary

Skilled trades:

- Electrician (renewable energy installation)
- Renewable energy technician (wind turbine maintenance)
- Trades associated with natural resource development (i.e. welding, carpentry)

College:

- Environmental technician
- Environmental management and assessment
- Ecosystem restoration

University:

- Environmental studies
- Biology
- Chemistry
- Political science
- Business
- Environmental Engineering – and other streams
- Geography

6. Purpose of the “Living Walls in the Classroom” project

Key issues:

- Understanding the topics that will be covered in this project
- Learning the basics about living walls

Curriculum material:

We are here to teach you about living walls, and the connections between plants and cleaner air. Specifically:

- What are living walls?



- What benefits do they bring?
- What do you need to consider when you are building a living wall?

Later in the program, we are actually going to build a living wall in your school!

Living walls - are vertical gardens (built on a wall) that can be either indoors or outdoors. They can bring numerous benefits, including, but not limited to cleaner indoor air.

Discussion Question: Why would you want to build a garden on a wall? What things would we need to build a living wall?

1. Choose a type of shelving to hold the plants, and a location for the wall – what factors do we have to consider as we decide on shelving and location?

- Sunlight
- Watering
- Safety
- Visual appeal – who will see it?
- Cost

2. Selecting plants – what to consider?

- Cost
- Water and light requirements
- Benefits to air quality
- Can it grow successfully inside?

7. Benefits to air quality and human health:

Key issues:

- How do plants benefit humans?
- Understanding volatile organic compounds (VOCs) and photosynthesis

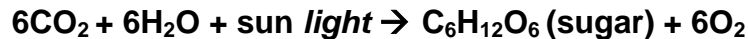
Curriculum material:

Plants are able to **reduce air pollution**: why is this the case?

Plants (and trees) are able to produce oxygen, which is clearly very important for humans to breath. They are also able to remove numerous toxins from the air.



1. **Photosynthesis:** (accompanied by a diagram in the PowerPoint presentation)



So *what does this mean?* It means that plants can take carbon dioxide (that humans help to produce) and combine it with water and light to make sugar and oxygen. The plants use the sugar for energy and release the oxygen as a waste product.

It is important to emphasize the role of carbon dioxide in photosynthesis - as we often hear a lot about CO₂ when talking about climate change. Plants not only need CO₂, but they are able to take it from our atmosphere and convert it into oxygen. They play a very important role!

2. **Removing airborne toxins and volatile organic compounds (VOCs):**



- Plants can remove up to 60% of airborne mould and bacteria
- Plants can reduce the amount of volatile organic compounds (VOCs) – toxins in the air that can come from indoor materials such as plastics, household chemicals, or wood.

How do VOCs get into the air? VOCs are chemicals that have a very low 'boiling point' – it is so low that they actually turn into a vapour at room temperature.

Discussion Question: What are some examples of plastics or chemicals used in your classroom?



8. Which plants remove toxins?

Key issues:

- What plants will help us to remove VOCs from the air?

Curriculum material:

Different plants are able to remove volatile organic compounds (VOCs). But *not all* plants can do this, and some plants do this better than others. We will explore more plants that can remove VOCs during Session 2.

For example:

1. Aloe Vera:

- Removes formaldehyde and benzene (can be found in cleaners and paints)
- Easy to grow, but requires sunlight

2. Bamboo Plant:

- Formaldehyde, benzene and trichloroethylene (found in plastics, inks, wood and rubber products)
- Easy to maintain, but requires low light conditions

9. Journal Assignment & Reflection

In your journal, write about one plant that you could grow indoors. What things will you have to consider when selecting this plant? How important are sunlight and water requirements? Are there other issues that must be taken into consideration?



Session 2

**By the end of this session,
participants will:**

- Review material from Session 1 – the environmental sector, environmental work, photosynthesis & VOCs
- Identify plants that remove VOCs from the air
- Learn about additional uses for plants
- Understand food plants and food webs
- Be aware of traditional knowledge related to plants
- Understand the process of designing a living wall
- Consider issues of cost related to living walls



1. Review material from Session 1

Key issues:

- Reviewing material from Session 2 – the environmental sector and environmental work

Curriculum material:

(Display PowerPoint pictures while having students identify the following):



Discussion Questions:

1. Does the picture represent the built or the natural environment? (4 pictures)
2. What kinds of jobs are in the environmental sector? (4 pictures) What classes would you take to help you with these careers?

2. Understanding the role of plants

Key issues:

- Reviewing the material from Session 2 – photosynthesis and VOCs

Curriculum material:

During the last class, we learned that plants need CO₂. In fact, they are able to take CO₂ out of the air and release O₂ back into the air. This process creates the conditions for humans to inhabit the Earth.

Discussion Questions:

1. What is this process called?
2. Why is photosynthesis so important?

We also learned that plants are able to remove certain pollutants from the air, including chemicals known as volatile organic compounds, or VOCs. VOCs are chemicals that turn into vapours that can then be inhaled by humans. These chemicals can be harmful.



Discussion Question: What are some materials in this classroom that can release VOCs?

- Plastics
- Wood
- Paint

3. The role of plants continued: increased air quality

Key issues:

- Identifying plants that can remove VOCs from the air
- Learning about additional uses of plants

Curriculum material:

(Students will be given ten cards with pictures of different plant species on each card. Five of the cards will illustrate VOCs removing plants, while the other five will illustrate food plants).

- In your group, select the five plants that you think can remove VOCs from the air.

The plants from the cards that can remove VOCs from the air are:



- Aloe Vera (removes formaldehyde and benzene)
- Bamboo Plant (removes formaldehyde, benzene, and trichloroethylene)
- Chinese Evergreen (removes benzene)
- English Ivy (removes formaldehyde and benzene)
- Peace Lily (removes formaldehyde, benzene, and trichloroethylene)

We have now talked about how important plants are in ensuring that we have clean air to breath. Plants are able to clean the air by taking out toxins (VOCs, bacteria & mould), and also



by releasing O₂ into the Earth's atmosphere. Interestingly, plants are useful in many other ways.

Discussion Question: In addition to cleaning the air, what else can plants be used for?

Hint: Last week, we learned that through photosynthesis plants create sugar. Since plants use sunlight to create food for their own survival, what else can people/animals do with plants? What happened to the plants that were grown via the GreenThumbs project in your school?

4. Uses of plants continued: plants as food

Key issues:

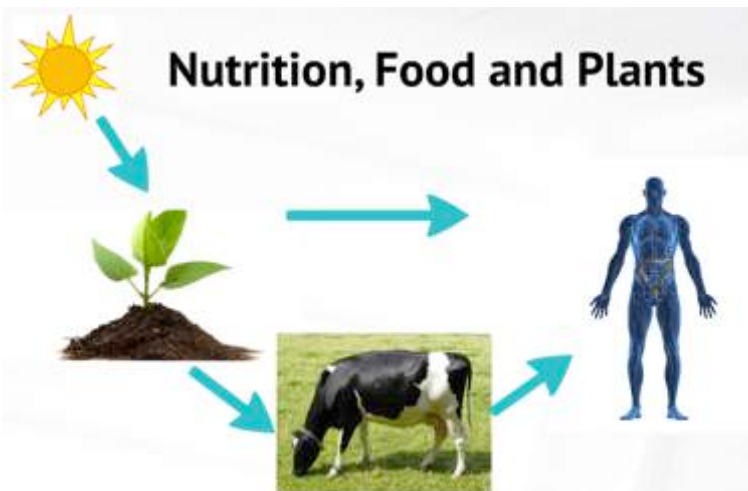
- Understanding the properties of food plants
- Making connections between photosynthesis and food webs

Curriculum material:

Since photosynthesis allows plants to take CO₂, H₂O, and sunlight and convert these into sugars and O₂, plants provide humans with all of our food needs, even while they are providing us with oxygen to breath.

Even when we are eating non-plant foods like meat or dairy, we are still relying on plant energy from photosynthesis. Why is this?

Diagram in PowerPoint presentation- Simplified version of the food chain: Plant → Animal → Humans

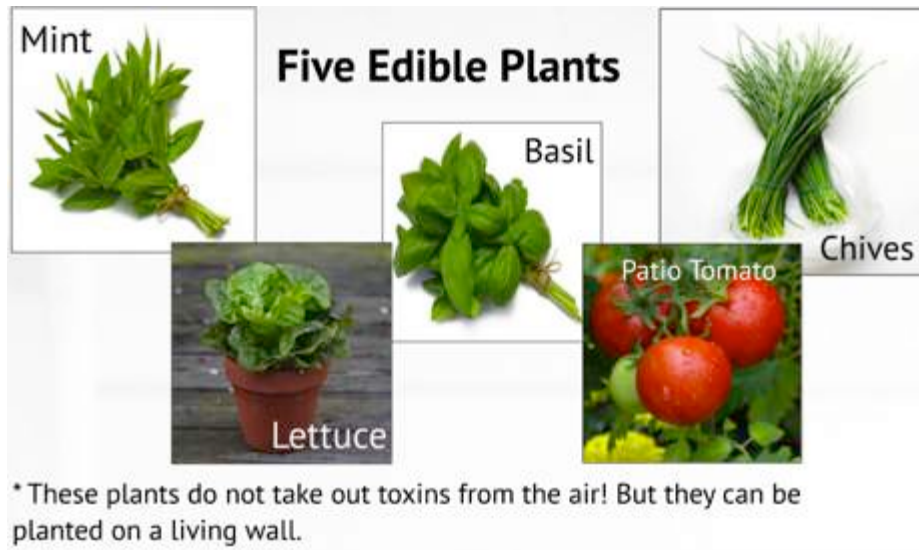


(Students will be given ten cards with different plant species on each card. Five of the cards will illustrate VOC removing plants, while the other five will illustrate food plants).

- In your group, select the plant(s) that you think you could eat.



5. Food plants and living walls: balancing priorities on a living wall⁵



Key issues:

- Identifying plants commonly used as food
- Clarifying trade-offs between food plants and VOC removing plants

Curriculum material:

Many of the plants that we often eat can be planted on a living wall. These plants however, do not remove VOCs from the air.

Discussion Question: Even though these plants do not remove VOCs, they still undergo photosynthesis. What does this mean for our school's air?

Examples:

- Basil: 6-8 hours of light daily
- Mint: indirect light
- Patio Tomatoes: warmth, but limited direct sunlight
- Chives: 6-8 hours of light daily
- Lettuce: 10-12 hours of light daily

It is important to remember that these food plants do not take toxins out of the air. However, they do remove CO₂, and provide O₂, allowing us to breathe. Since we want our living wall to provide us with cleaner and healthier air by removing VOCs, we cannot only plant food plants.

⁵ Edible Walls Blog. "Plants" Section. Retrieved September 2012 from <http://growediblewalls.com/plants/>



6. Plants and traditional knowledge

Key issues:

- Learning about the traditional uses of plants

Curriculum material:

Discussion Question: How does your family use plants?

We have now discussed a few different uses for plants – cleaning the air of toxins, releasing O₂, and providing humans (and all other organisms on Earth) with energy and food. But plants have even more uses!

Discussion Question: Besides cleaning air, releasing oxygen, and providing food, how have humans used plants in the past and present and in different cultures (see slides)?

- Plants as construction material
 - Housing

Plants and Traditional Knowledge



- Tools for hunting and farming
- Plants as decoration and art
- Plants to protect people – for example, using wetlands for flood control
- Plants for religious ceremonies throughout many different cultures
- Plants for medicine and healthcare

All societies have used plants in the past, and continue to use them today. There are many different subjects that study how past cultures used plants, such as biology and social studies.



7. Traditional Ecological Knowledge continued

Key issues:

- How can we define traditional knowledge?
- What are the connections between Aboriginal people, traditional knowledge, and plants?

Curriculum material:

Traditional Knowledge - is information that has been handed down through many generations by Aboriginal people. Aboriginal people have used and continue to use this information in their everyday lives to live sustainably. A large amount of traditional knowledge involves knowledge of plants, and is still used today.

There are many different Aboriginal groups in Canada (Metis, Inuit and First Nations), with different cultures, languages, histories and traditions. Because of this, there are many different types of Traditional Knowledge.

Traditional Knowledge can involve information about the following (see slides):

- Collecting, hunting, or growing food
- Medicinal and health care traditions
- Seasons and weather
- Living comfortably in challenging climates – cold, hot, wet, dry, etc.
- Spirituality

It is important to emphasize that much of this traditional knowledge (although not all of it) is closely related to plants. Traditional knowledge related to growing, collecting and using food involves a detailed understanding of plants. Likewise, many traditional medicines originated from plant knowledge. Traditional knowledge about plants also plays an important role in some Aboriginal ceremonies related to spirituality. Our living wall will focus on cleaning the air in our school, but it is important to remember that all cultures and people have found many interesting and important uses for plants.

8. Planning the Living Wall

Key issues:



- Understanding the factors that must be considered when building a living wall

Curriculum material:

Discussion Question: What do we need to think about when planning a living wall?

- Purpose – what toxins will we remove from the air?
- Availability of space – how large will the wall be?
- Light requirements – will this be a sunny or shady wall?
- General location – how many people do we want to see the living wall?
- Watering needs – does this location require frequent watering? Is it easy to access?
- Safety – does the wall interfere with people in an unsafe way?
- Cost – is the space size and location affordable for the project budget?
- Other considerations?

9. Student activity

Key issues:

- Learning about key differences between food plants and VOCs removing plants
- Considering and planning for cost when designing a living wall

Curriculum material:

The student activity will take place in small (3-5 people) groups of students. Each group will have ten plant cards showing five plants that remove VOCs and five plants that are commonly used as food. Each card will also show the average cost of the plant and light requirements. Students will be asked to select five plants to place on their living wall. It will be emphasized that while the food plants remove CO₂ and produce O₂, they do not remove VOCs. Therefore, students will need to carefully plan their selections during this exercise.

Part 1 (suggested time: 10 minutes):

- Working in your group, select only five plants that you would put on your living wall.
- Decide on which wall in your classroom would you build the living wall?
Discussion questions: How and why did you select these plants? Did you choose mostly food plants or air cleaning plants? Why did you select that location for your living wall?

Part 2 (suggested time: 5 minutes):

- In your group, calculate how much your plants will cost in total.
- *Discussion questions:* How much will your selections of plants cost? What other things will you need to buy when you are building a living wall?

Additional factors to consider:

- Shelving boards
- Brackets



- Screws and nails
- Paint and brushes
- Labour – cutting and installation
- Others?



Session 3

**By the end of this session,
participants will:**

- *Review material regarding VOCs, photosynthesis, and traditional ecological knowledge from sessions 1 and 2*
- *Learn about different design options for living walls*
- *Work individually and in groups to design art to be painted on the wall*
- *Learn about consensus building to consolidate design options*



1. Review material from Sessions 1 & 2

Key issues:

- Brief reviewing of material – the benefits of living walls

Curriculum material:

As discussed in Sessions 1 & 2, living walls bring many benefits to schools and other buildings such as:

- The removal of volatile organic compounds (VOCs)
- The removal of CO₂ during photosynthesis and the release of O₂
- The possibility of growing food plants year round
- The possibility of including and learning about plants traditionally important to Aboriginal people

Discussion Questions:

1. While living walls can clearly bring many benefits, what is the main purpose of the wall being build during this project?
2. Is the living wall considered part of the built or natural environment?

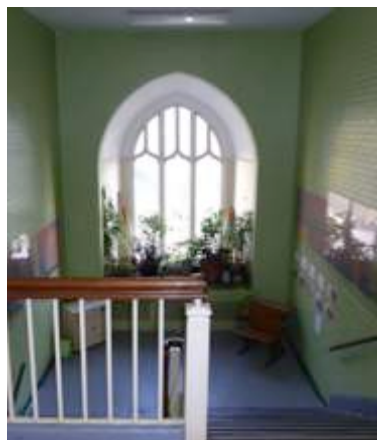
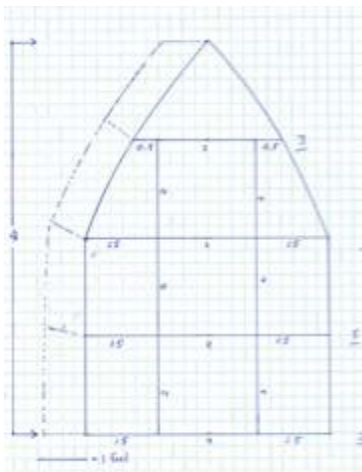
2. Review material from Sessions 1 & 2

Key issues:

- Understanding the living wall design being used in this project, and the defining components of a living wall

Curriculum material:

Living walls can come in many different shapes and sizes, but there are some features that are generally found on all living walls, making them different compared to a few plants on a shelf.





Living walls very often include the following features:

- Design incorporating the host building – in this example, our living wall shape has matched the shape of the window that it will be built beside. Living walls should make an effort to compliment the spaces they are built in.
- Permanence – Unlike a small number of plants on a shelf, living walls are usually very permanent structures. This means they can bring long-term benefits, but it also means they must be designed and built with care.
- Larger number and diversity of plants – because living walls tend to be larger than one shelf, they provide an opportunity to incorporate many different types of plants. In this example, this diversity will allow us use different plants that are able to remove VOCs from the air.

Discussion Question: How is a living wall different from a shelf with only a few plants on it?

3. Student Activity: creating paint designs

Key issues:

- Students will be given instructions to sketch living wall shelving boards, and to create a paint design for the wall

Curriculum material:

Conditions for Design:

1. Draw a rectangle in your sketchbook that is 5cm X 20cm – this is a top view
2. Using the coins provided, trace 4 circles across your rectangle, evenly spaced
3. Come up with a design that you think would look good on our living wall
4. Use only red, blue, and yellow – draw light colours first (why?)
5. Use black only as an accent – what is an accent?

4. Student Discussion: building consensus

Key issues:

- Students will learn about building consensus so they can take their individual wall designs and consolidate them into final designs that will be painted onto the wall during the next session



Curriculum material:

When looking to build consensus, the following strategies can prove very helpful:

- **Listen** to ideas from everyone in the group
- Are there common ideas that everyone **shares**?
- What are ideas that group members disagree on?
- Can the ideas we agree on be combined?
- Do our group discussions include **respect** and **reciprocity**?

Discussion Questions:

1. What is a consensus?
2. Will everyone in your group get everything they want in a consensus?

5. Student Activity: creating final designs

Key issues:

- Students will work in groups to take their individual paint designs and complete two final designs that will be painted on the living wall

Curriculum material:

Conditions for students:

1. In your groups, come to a consensus on two designs for your living wall shelving boards
2. You will be responsible for painting these designs on the boards during the next session
3. Draw your group designs on the template you have received



Session 4

**By the end of this session,
participants will:**

- *Review material regarding VOCs and plants from sessions 1 and 2*
- *Work in groups to design and create informational posters to hang alongside the living wall*
- *Work in groups to design artwork to be painted on the living wall's shelving boards*
- *Paint the wall!*



1. Living wall decorations and design introduction: 5 minutes

Key issues:

- Explain session objectives to students and divide class into appropriate group sizes

Curriculum material:

Divide the class into **9 groups** with 3-4 students per group (depending on the total number of students). Groups will be numbered 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Discussion Question: How could you decorate your living wall? What are some important considerations? Think about what you know from art class.

2. Plan your own design: 10 minutes

Key issues:

- Using knowledge of paint mixing art, students will create designs related to plants and clean air

Curriculum material:

Working together, each group will be responsible for planning the design of their section of the living wall (3 feet x 1 foot section of shelving). Students will plan out their design by drawing it on the blank sheet of paper provided prior to painting.

3. Painting time and information poster activity: 25 minutes

Key issues:

- Student will paint the living wall and create information posters

Curriculum material:

Groups 1, 3, 4, 6, 7 and 9 will take their designs and move to the back of the class to the painting station (see diagram below). Groups 2, 5 and 8 will stay in their desks and a person will come around providing them with instructions for the 'information poster activity' (students will make posters outlining some of what they have learned during the in-class sessions. These posters will hang beside the finished living wall). Instructions to students: Help explain the project to passerby's by drawing what you learned so far about plants, living walls, and air quality.



4. Groups switch stations: 25 minutes

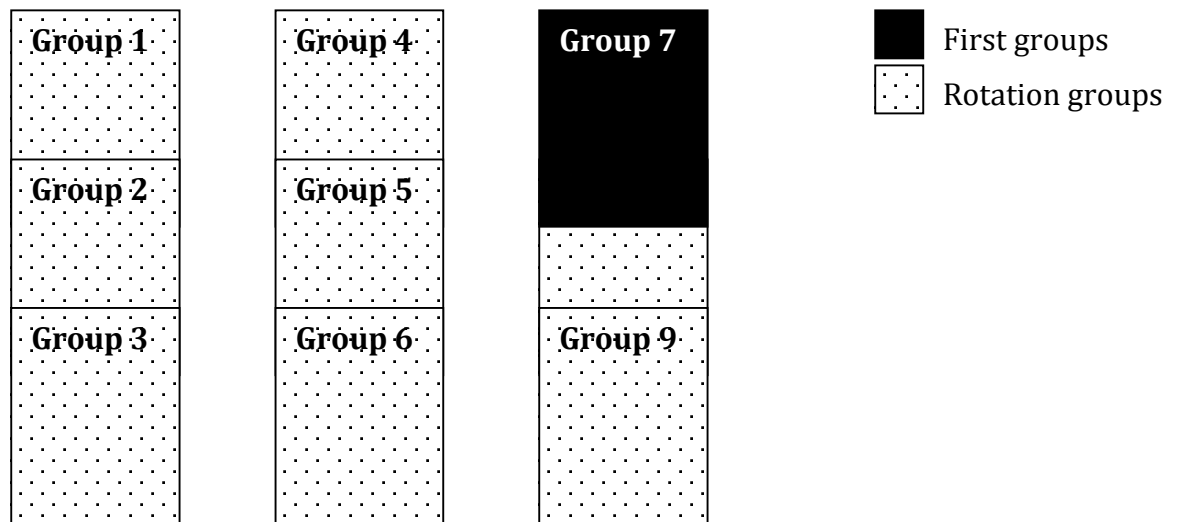
Groups 2, 5 and 8 will take their designs and move to the back of the class to the painting station. Groups 1, 3, 4, 6, 7 and 9 will go back to the front of the class and a person will come around providing them with instructions for the ‘information poster activity’, as outlined above.

5. Clean up time: 10 minutes

Students, program staff, and teachers will ensure both the painting and poster sessions are left clean after Session 3.

6. Additional details

Both grade 5 classrooms will have 3 wooden boards to paint. Each board will be divided into three sections (3 feet x 1 foot). In each class, students will be divided into 9 groups with each group responsible for a section. The groups will rotate to paint the living wall.



Class set-up - The boards will be set-up at 3 painting stations. The rest of the desks will be available for students doing the ‘information poster’ activity.

Materials - Paint, cups for paint and water, boards for paint mixing (~6), brushes (~25), paper towels, tablecloths (3), and newspapers.



Sample work plan (*work plan may need to be adjusted depending on needs*)

Timeline per Task	Task Objectives	Indicators of Success
Task 1:	Confirm project dates with partner school (i.e introduction, wall planning, wall building, and class follow-up sessions).	Date and time confirmed with principal and teachers for the planned in-school sessions
Task 2:	Confirm lesson plans and curriculum with teachers. Adjust provided lesson plans as needed	Final lesson plan outlines approved by the school and teachers
Task 3:	Finalize plans to acquire living walls materials (either shelving or suitable lumber), and plants	Plan should result in shelving materials and plants being obtained well before wall installation date
Task 4:	Create and finalize presentation for first in-class session. i.e. customize provided lesson plans and rehearse presentation	All visuals and handout materials completed and printed - presentation fully prepared for students
Task 5:	Complete first one-hour session	Session completed with focus on 1) <i>introduction to living walls</i> , 2) <i>working in the environmental sector</i> , 3) <i>take-home activity</i>
Task 6:	Create and finalize presentation for second in-class session. i.e. customize provided lesson plans and rehearse presentation	All visuals and handout materials completed and printed - presentation fully prepared for students
Task 7:	Complete second one-hour session	Session completed with focus on 1) <i>Session one recap</i> , 2) <i>Planning the living wall</i> , 3) <i>Student-led activity</i>



Task 8:	Obtain all materials for living wall (excluding plants)	Wall shelving and/or lumber is received, stored & organized for delivery to school
Task 9:	Deliver wall materials to school and prepare for shelf painting by grade 5 students in the classroom	Wall materials are delivered to school, moved to classroom for painting, paints, brushes etc. acquired
Task 10:	Complete third one-hour session	Shelving is painted by participants and readied for installation on the school wall
Task 11:	Create and finalize presentation for fourth in-class session. i.e. customize provided lesson plans and rehearse presentation	All visuals and handout materials completed and printed - presentation fully prepared for students
Task 12: (approximately 1 week)	Obtain plants for Living Wall – selection of plants will be determined by student activities, and availability/feasibility	Plants are received, stored & organized for delivery to school
Task 13:	Assemble and install painted shelving units in school	Painted wall materials are fully assembled, secured to wall, and readied for plant installation
Task 14:	Complete fourth one-hour session – completing the living wall	Session completed – plants are installed, and maintenance requirements are outlined to school staff and students
Task 15:	Organize project documents pictures for posting on your organizations website	All current project documents are organized for future use, evaluation is implemented, and specific actions are planned for program expansion (pending later follow-up)