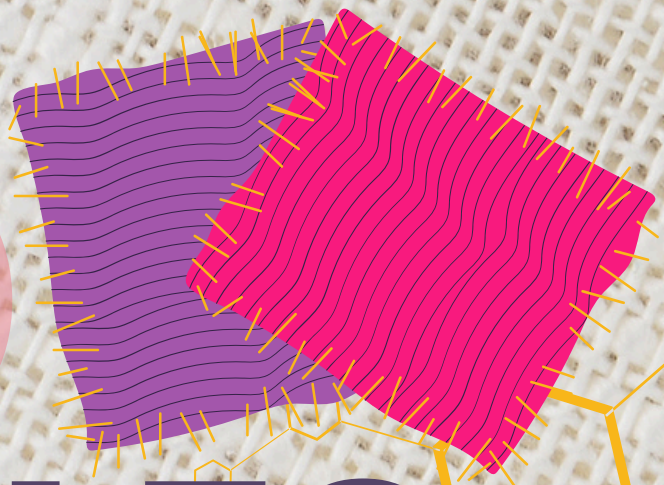
BIO TEXTILES



Let's make plastic art that is made from edible ingredients.

Brilliant LABS LABOS Créatifs

What IF...

we produce plastic textiles that are biodegradable and doesn't contribute to pollution?

Students will develop innovative designs by exploring biological systems in nature and collaborating with harmless microbes such as fungi, bacteria, yeast, and algae. The final product will be a series of unique, sustainable textile designs or materials that incorporate biological elements, demonstrating how these microorganisms can be harnessed for creative and environmentally friendly purposes.

This knowledge can be applied to address global challenges related to textile pollution and environmental sustainability. By integrating biological systems into textile design, students will contribute to reducing the environmental impact of textile production, which includes excessive water and energy use, harmful chemicals, and significant waste. Their innovative approach can help mitigate issues associated with fast fashion, synthetic fibers, and global transportation emissions.

Ideation and problem-solving will be central to the project as students brainstorm and develop creative ideas for using microorganisms in textile design. Their ability to experiment with and adapt biological systems to create sustainable textiles will be crucial to the project's success, leading to new, eco-friendly materials that challenge conventional practices.

UN SDG

- Working with nature and its biological systems

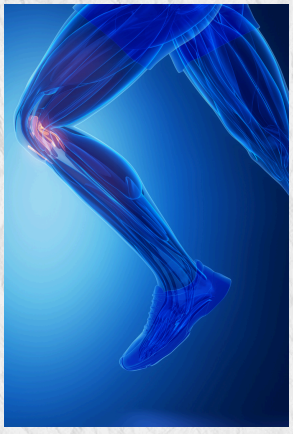
- Fostering creativity, technical skills, and collaborative problem-solving, supporting a well-rounded educational experience

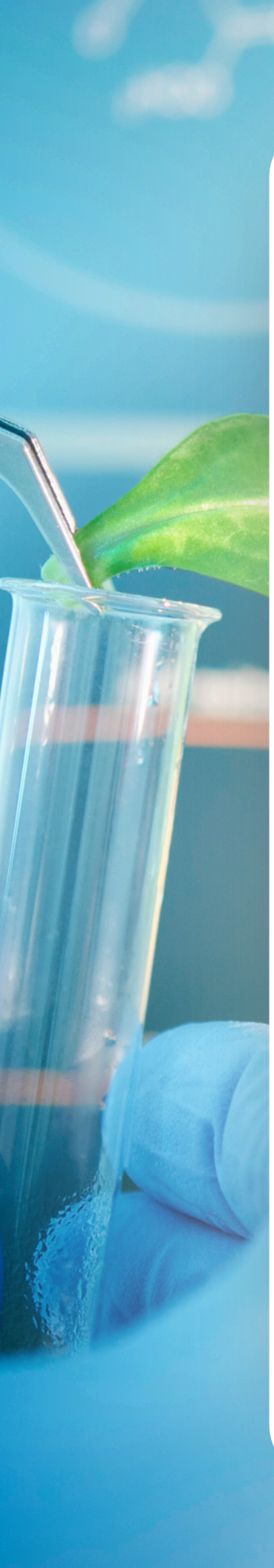
- Promoting more responsible consumption patterns

- Reducing the environmental footprint of the textile industry
- Contributing to sustainable resource management

FUN FACT

Biotextiles aren't just for clothes—they're used in surgery, tissue engineering, and even artificial ligaments, with silk being a star material for its strength and biocompatibility!





SKILLS

Students will learn :

Biological Systems:

Gaining knowledge in microbiology, material science, and sustainable design practices.

Experimental methods:

Experimenting with biological organisms, understanding their interactions with textiles, and applying this knowledge to create eco-friendly materials.

Sustainability:

Reducing waste and promoting eco-friendly practices.

Did you know?

Our Biomaking visual guide is a useful tool for educators and students who want to begin their biomaking journeys.

Topics/curriculum area

Science : Microorganisms, Chemical Reactions
Technology: Biomaking, Tools (e.g. measuring cups, blender, mixer).
Engineering: Textile Manufacturing, Planning
Art: Textile Manipulation, Reading procedural text
Mathematics: Number Sense, Ratios and Proportion

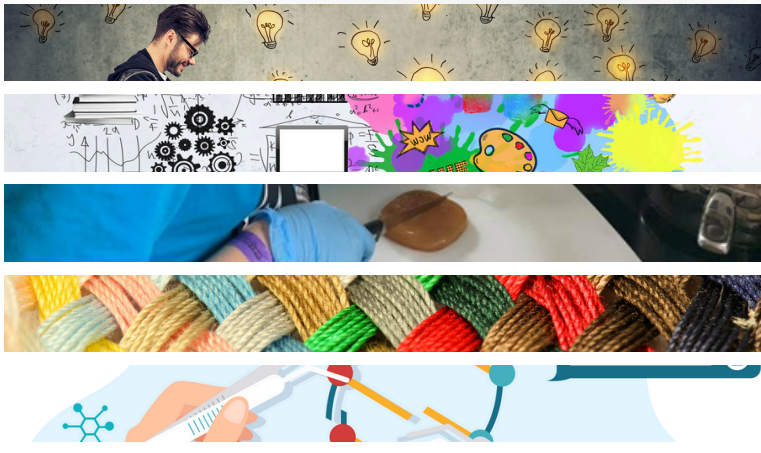
Competencies

This project has been designed to support the Council of Ministers of Education, Canada global competencies:

- critical thinking and problem solving
- innovation, creativity, and entrepreneurship
- learning to learn/self-awareness and self-direction
- collaboration
- communication
- global citizenship and sustainability

BADGES

- Entrepreneurship
- Design Thinking
- Biomaking
- Textile
- Manipulation



Levels of activity

Hello World

- create alginate strands

Intermediate

- create alginate strands that react to different environmental situations
- Use the alginate strands to knit, crochet or weave something.
- use alginate to make “beads” of different sizes. use the beads to create jewelry

Advanced

- explore how the properties of the alginate is affected by quantity and type of materials used

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- identify how alginate can be used in different situations.
- create alginate for specific purposes to solve a problem

Timeframe

2- 24 hours, allowing time blending and for alginate to dry overnight if necessary

Suggested grade level

K - 12

Materials & resources

In the Kit:

- sodium alginate
- texture agent
- reactive pigment
- resealable compostable bags
- measuring teaspoons
- measuring cups
- calcium chloride
- containers for calcium bath
- syringes
- alcohol wipes
- protective gloves
- safety glasses

Not in the Kit:

- utensils to mix the ingredients
- boiled or filtered water
- water-based food colouring
- tap water
- scissors
- drying surface for the algae strings.

Useful resources

Biotextiles **Mode innovante** **Biomaking**

Possible development

Introduction

Discuss the concept of textiles: what they are, different types, impact on daily life

Introduce bio-innovation and biodegradable textiles

- Explain the concepts of bio-innovation and biodegradable textiles.
- What does bio-innovation mean? Where does the inspiration come from? What are the advantages of biodegradable textiles over conventional ones?

Discuss conventional textiles and their issues

- What are some problems with conventional textiles? Consider their environmental impact, particularly regarding textile waste in landfills.
- Many textiles are made from non-biodegradable materials. How long do you think these materials last in the environment? Who does this affect? What actions can be taken to address these issues?

Explore creating biodegradable textiles in the classroom

- Imagine if we could create our own biodegradable thread using algae. Show the video on Algiknit to illustrate this concept
- Explain the chemical process: When sodium alginate ($NaC_6H_7O_6$) interacts with a calcium bath, it undergoes a reaction that forms calcium alginate ($C_{12}H_{14}CaO_{12}$), a gelatinous substance that can be used in knitting and art.

Creating the PROJECT

Preparing the mixture

1. Put on safety gear (safety goggles and gloves).
2. Sanitize the measuring equipment
3. Make algae gel by mixing 1/2 cup (120ml) pre -boiled water (cold), 1 tsp (5ml)sodium alginate and 6 tsps (75ml) of the texture agent in a resealable bag. Students can add a small amount of pigment or 2-3 drops of food color if desired.
4. Seal the bag and squish all the ingredients together, using your hands. Don't do it too rigorously, as the bag may burst. Continue until all ingredients are thoroughly mixed, forming a gel. There may be some clumps of sodium alginate, but it's okay. They will dissolve eventually
5. Leave your algae gel to rest until all the air bubbles are gone and the clumps are dissolved. This process may take some time, and you will need to wait (1 hr to overnight)

Creating the PROJECT

Making the algae knits

6. Time to make your calcium bath! using the provided empty container, add 2 tsp (10ml) of Calcium Chloride ($CaCl_2$) and 2 cups (450ml) of water. Mix well until $CaCl_2$ dissolves completely.
7. Use your bag with the algae gel as a piping bag. Twist the top part, sliding all the contents to one of the corner ends. Use scissors to snip a tiny corner of the bag off. Start with a smaller hole as you can make adjustments as needed later.
8. Begin the extrusion process. Squeeze the bag and disperse the algae gel into the calcium bath. (try to keep the pressure even to keep the strand constant. This will cause a chemical reaction, making the gel into a solid stringy material.
9. Let the string sit in the bath longer than a few minutes and then remove it to get the desired strength and stretchability. Keep experimenting!
10. To make alginate beads put the alginate in a syringe and extrude a small drop at a time.

Creating the PROJECT

Make art

11. Create art with the algae string! The string can be used right away or after drying. Try braiding, knotting, crocheting, knitting, weaving or any string art of choice.
12. Beads can be put onto a thread with a needle before they are dried.
13. The string and /or beads can be returned to the calcinate bath after it has been manipulated to make it firmer if desired.
14. Leave the finished art to dry completely.

Did you know?

Algae produce over half of the world's oxygen and are being used to create biofuels, plastics, and even eco-friendly food!

Possible Problems:

The threads might break

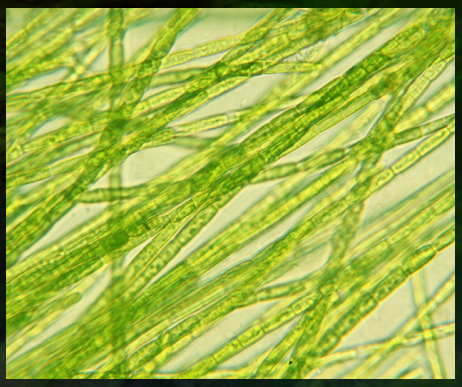
- leave the strings in the calcium bath for longer to make it more flexible, add more glycerin

The threads might be too thick

- seal the hole in the bag and cut a smaller hole in the opposite corner
- use a large syringe to extrude alginate

Uneven thread sizes

- ensure lumps of alginate have dissolved properly
- apply even pressure when extruding alginate



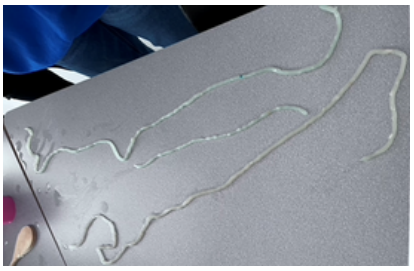
Fun Fact:

Algae can be transformed into eco-friendly fabrics that are biodegradable, require minimal resources to grow, and even absorb CO_2 during production!

Facilitator tips

Provide Demonstration:

When cutting the tip of the bag, be careful not to cut a hole that is too large or the strings will be too thick.



Safety tips

Personal Protective Equipment:

safety goggles and gloves

Handle materials with care:

Extra caution is needed when handling chemicals.

It is important to sanitize all equipment before use.

Do not consume any materials you use even though they may seem edible.

Glossary

Calcium chloride
A chemical substance that can be in power form or small pieces. When mixed with water, it dissolves easily and can help make gels or harden certain food.

Algae
Simple organisms that resemble plants and live in the water. They can be very small like plankton or large like marine algae.

Sodium alginate
Simple organisms that resemble plants and live in the water. They can be very small like plankton or large like marine algae.

Pastry bag
a cooking bag with a small opening on one end to pipe icing (or other soft foods), typically used to decorate cakes and cookies

Biodegradable
something that can naturally decompose

Innovation Challenges Possible:

Innovative Fashion

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