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PATHWAYS
TO MEDICAL EDUCATION

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Science North and Dynamic Earth are situated on the traditional and ancestral lands of Atikameksheng Anishnawbek and Wahnapitae First Nation in Robinson-Huron Treaty territory.

Science North's Sault Ste Marie satellite operations are situated on the traditional and ancestral lands of the Ojibways of Obadjiwan and Keteguanseebee in Robinson- Huron Treaty territory.

Science North's Thunder Bay satellite operations are situated on the traditional and ancestral lands of Anemki Wekwidong in the Robinson-Superior Treaty area.

Science North's Kenora satellite operations are situated on the traditional and ancestral lands of Wauzhushk Onigum, Niisaachewan and Washagamis Bay First Nations in Grand Council Treaty 3 territory.

We give thanks to the Indigenous Peoples who have cared for this land since time immemorial and pay respect to their traditions, ways of knowing, and acknowledge their many contributions to innovations in Science, Technology, Engineering, and Mathematics, past and present.

We recognize the Métis Nation of Ontario for their historic and ongoing contributions.

We commit to deepening engagement, relationships and partnerships in order to advance truth and reconciliation, honour and reflect Indigenous ways of knowing, grow economic opportunities, and collaborate with Indigenous peoples as partners in order to inspire all people to be engaged with science in the world around them.

Introduction to NOSM University

NOSM University is No Ordinary School of Medicine. What does this mean for you? It means that your path to becoming a doctor will be extraordinary too. NOSM University will take you beyond the lecture halls and textbooks to prepare you for a rewarding career that is sure to exceed your expectations.

Northern Ontario School of Medicine (NOSM), created in 2002, made history by becoming Canada's first independent medical university—now known as **NOSM University**—on April 1, 2022.

NOSM University faculty, staff and students do not function in a traditional medical school building. Rather, the walls of the University are the boundaries of Northern Ontario, spanning thousands of kilometers, with two main campuses and countless communities that are linked in some way to the University.

In the spirit of Truth and Reconciliation, NOSM University respectfully acknowledges that our pan-Northern campus is on the homelands of First Nations and Métis Peoples. The university buildings we occupy in Greater Sudbury and Thunder Bay are located on the territory of the Anishinabek Nation, specifically **Atikameksheng Anishnawbek, Wahnapitae First Nation, and Fort William First Nation.**

Indigenous Affairs at NOSM University worked in collaboration with Science North to create this STEM Booklet. **STEM stands for Science, Technology, Engineering and Math.** This booklet is an introduction to pathways in medical education and STEM activities you can do at home. It also includes learners who graduated from NOSM U and Elders and Knowledge Carriers who have been involved and supported the learner's journey.

The Office of Indigenous Affairs and other Student Services are here to support you in your journey to becoming a doctor!

Sudbury Campus
935 Ramsey Lake Road Sudbury, ON | P3E 2C6
Tel: 705-675-4883 | Fax: 705-675-4858

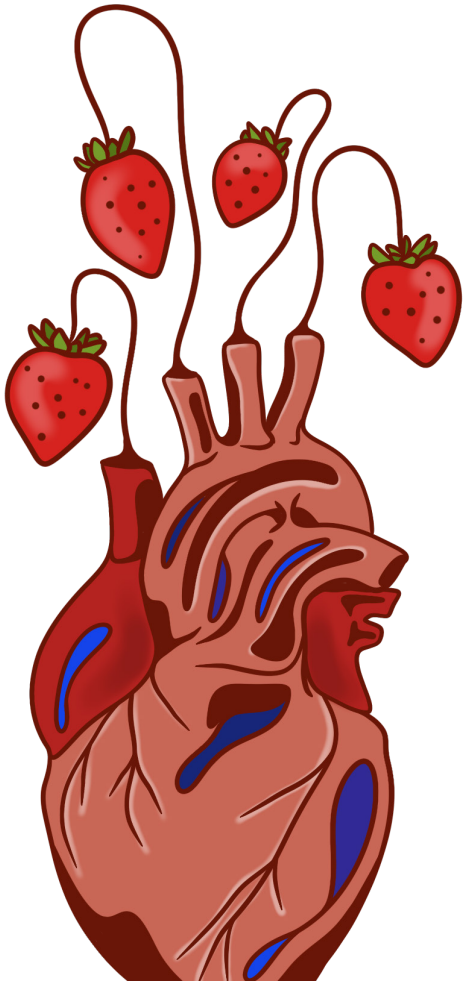
Thunder Bay Campus
955 Oliver Road Thunder Bay, ON | P7B 5E1
Tel: 807-766-7300 | Fax: 807-766-7370

nosm.ca
1-800-461-8777

THE INDIGENOUS HEALTH PRACTITIONER PATHWAY

NOSM University's aim is to have class profiles that reflect the demographics of the population of Northern Ontario. It is NOSM University's intention to maximize the recruitment of students who have lived in Northern Ontario and/or students who have a strong interest in and aptitude for practising medicine in northern urban, rural, and remote communities. NOSM U is committed to recruiting Indigenous, Francophone and Franco-Ontarian students.

The Indigenous Health Practitioner Pathway is a journey map to NOSM University! There are many ways to get to medical school and NOSM University recognizes there are many entry points. We have designed information graphics highlighting the different journeys you can take to get to medical school.



WHAT IS THE GOAL?

Becoming a doctor is a big decision, it takes many years of schooling to get to the application stage and many more years of schooling to graduate practicing as a doctor. It can range from 6-10 years of hard work, dedication, and support!

Canada's 17 faculties of medicine committed to building stronger relationships with Indigenous communities, increasing the numbers of Indigenous students and faculty members, addressing anti-Indigenous racism, ensuring all medical students complete a robust Indigenous health curriculum and other actions aimed at promoting Indigenous health. NOSM U sees this as a positive for the county. The goal is to see the class representative of the population.

WHAT IS THE INDIGENOUS HEALTH PRACTITIONER PATHWAY?

The Indigenous Health Practitioner Pathway is NOSM U's way to reach as many Indigenous students as possible who are interested in medical education and to share the pathways that are possible to coming to medical school. The focus is to reach Indigenous primary school, postsecondary students and folks interested in medical education. We see meeting folks where they are at and sharing the ways in which they may consider to getting to the application stage and into the class to graduate and practice.

IN THE NEXT FEW PAGES, YOU WILL SEE WHAT THE DIFFERENT PATHWAYS ARE TO MEDICAL EDUCATION.

PRIMARY SCHOOL TO MEDICAL EDUCATION

1 GET INVOLVED

- Spend time on the land.
- Talk to Elders, Knowledge Carriers, Leaders in your community.
- Learn about science, technology, engineering, and math in school!
- Attend summer camps.

2 LIVE A BALANCED LIFE

- Be active, spend time exploring.
- Eat well and hydrate.
- Take care of your mind, body and spirit!

3 FIND A ROLE MODEL

- Talk to someone you look up to.
- Find those people you admire and support you.
- Make a list of important characteristics.
- Talk to your doctor, nurse, or community health professional.

4 STUDY HARD

- Develop good study habits.
- Get good grades.
- Stay involved in your school extra curricular activities.
- Find fun and healthy activities to do outside of school

5 PARTICIPATE IN YOUR SCHOOL OR COMMUNITY SCIENCE/CAREER FAIRS

- Sign up!
- Get Involved!
- Ask a community leader to run a youth camp.
- Ask your school to get in touch with NOSM U opportunities, workshops and events!

SECONDARY SCHOOL TO MEDICAL EDUCATION

1 GET INVOLVED IN YOUR COMMUNITY

- Join Youth Programming!
- Find ways to volunteer!
- Take every opportunity you can to take a leadership role!

2 LIVE A BALANCED LIFE

- Be active!
- Take care of your mind, body and spirt!
- Have hobbies & interests outside of academics.

3 FIND A ROLE MODEL

Someone you admire in all aspects of their life and leads a healthy life.

4 STUDY HARD

- Get good grades and develop good study habits!
- When choosing a university degree, choose something you are good at AND that you enjoy.

5 ATTEND CAMPMED AT NOSM UNIVERSITY

CampMed is offered to High School Students every July at both Sudbury and Thunder Bay campuses. Registration opens in spring time!

Visit **nosm.ca** to learn more!

POSTSECONDARY TO MEDICAL EDUCATION

1 STAY INVOLVED IN YOUR COMMUNITY

- Join postsecondary STEM opportunities.
- Find ways to volunteer.
- Attend an Indigenous Physician Association of Canada event!

2 LIVE A BALANCED LIFE

- Be active.
- Eat well and hydrate.
- Take care of your mind, body and spirit!

3 CONNECT WITH A ROLE MODEL OR MENTOR

- Find someone interested in healthcare.
- Talk to a doctor or specialist.
- Join a mentorship or role model program.

4 FIND YOUR PASSION

- Find a program that interests you and you love!
- Get involved with your school student services.
- Work on achieving excellent grades.
- Build your resume and extracurricular activities.

5 PARTICIPATE IN

- NOSM U Information Sessions.
- Join a NOSM U Indigenous Admission Stream Info Session.
- Volunteer at CampMed.
- Get in touch with NOSM U opportunities, seminars, workshops and events!

HEALTH CAREER PATHWAY TO MEDICAL EDUCATION

1 GET INVOLVED

- Spent time on the land.
- Talk to Elders, Knowledge Carriers, leaders in your community.

2 LIVE A BALANCED LIFE

- Be active.
- Eat well and hydrate.
- Take care of your mind, body and spirit!

3 CONNECT WITH A ROLE MODEL

- Talk to someone you look up to.
- Find those people you admire and support you.
- Seek a learner, resident or physician to talk about medical school.
- Join a mentorship program.

4 PARTICIPATE IN

- Opportunities to cultivate your interest in medicine.
- Build your resume, include why you are unique!
- Attend NOSM U Indigenous Admission Stream Info Session.
- Get in touch with NOSM U opportunities, seminars, workshops and events!

Admission Streams at NOSM University

General Admission Stream
You are considered for admission the General Admission Stream unless you apply to one or more of the following streams:
1. Indigenous Admissions Stream.
2. Francophone Admission Stream.
3. Military Medical Training Program (MMTP) Stream.

For more information on Application Information and Admission Requirements, visit nosm.ca.

Indigenous Admission Stream
As a key to increasing the Indigenous physician workforce, NOSM University designates a minimum of six (6) seats each year for Indigenous students who have significant living experience and/or a cultural connection to Northern Ontario. This is does not reflect the total number of Indigenous students admitted.
Persons of Indigenous ancestry (First Nations, Inuit, or Métis) who apply to the Indigenous Admission Stream must:
1. Write a personal letter about your background, your involvement with and contribution to your Indigenous community.
2. Provide a letter of recommendation from a member of your community.
3. Provide proof of Indigenous ancestry.

Francophone Admissions Stream
Although English is the language used for communication, instruction, and assessment at NOSM U, numerous opportunities are provided to enhance the experience of Francophone students.
All applicants who apply to the Francophone Admission Stream must:
1. Submit an essay in French (outlined on the NOSM website).
2. Provide a recommendation letter.

Canadian Armed Forces – Military Medical Training Program (MMTP) Stream
NOSM University's MD Program participates in an agreement with the Department of National Defense (DND) in creating up to 5 additional training positions for Regular Force Members of the Canadian Armed Forces (CAF).

CampMed at NOSM University

Be inspired to consider a future as a healthcare professional!

Annual Summer Camp
- For High School Students in Northern Ontario.
- Hosted in Sudbury & Thunder Bay.
- Registration opens in early spring.
- Camps take place annual in mid-July.

Opportunities through Workshops
- Explore health-care careers.
- Indigenous and Francophone culture.
- Hands-on experience!
- Find a mentor!

Scholarships Available
- Registration, Travel & Accommodations.
- Will not cover the entire cost of attending.

"I just finished the Cedar Tea by the Campfire Workshop, and I just wanted to say that I loved it! I loved all the presentation, the interactions, and all the time put into it, and into all the CampMed! It's super interesting and I have learned so much. I'm glad I decided to apply to this and get accepted! Thank you so much for everything, this amazing account, the prerecorded videos, and all the live workshops!"

– Ania, CampMed 2021

Follow us on Instagram
NOSM_FutureMDs

Anishinaabemowin
medical terms

X I M P Q X J Q Z Z A P C I H A M F D H
J N A O U O P N A Y K S X L M I W U K C
W M A X S M M T V H U E A C U A S R V Z
B A S N L A A K O Z I I W I G A M I G V
E S C G A K V S U R G P B E D V L Y K G
W H E V C A U H H V K Y O G P Z U O T I
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Z I C H W X C D E A I L P B J G T T Y H
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C I I V G I R E C T R F I C H P C F T I
P I M P I T E Y W Y A Y S I S A S V M I
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D I S C I A I R G S B V D E B W W P J Z
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I H Z Q I I H Y R V I K E U Q B R V A Y
N K N M B N O E C I F Y T I U T X V V N

aakoziiwigamig
hospital

agoninjiibizon
bandage

giibid
tooth, your

mashkikiiiwikwe
nurse practitioner

gimisad
stomach, your

gishkiinzhig
eye, your

giwiinindib
brain, your

mashkikiiwinini
doctor

giige
heals

gizid
foot, your

nitaawigiwin
growth

nanaandotandochigan
stethoscope

Council of Elders at NOSM University

Since 2005, NOSM University has developed relationships with Elders and Knowledge Carriers. The Council of Elders is comprised of Indigenous peoples who carry gifts and significant knowledge of traditional, cultural, and spiritual customs and practices.

They provide support and teachings to students, staff, and faculty, offer traditional ceremonies and blessings, and work with NOSM University to ensure connections are maintained with First Nations and Metis across the North.

About the Artist

Shelby Gagnon *is an Anishinaabe/Cree artist from Aroland First Nation of the wolf clan. She is an arts educator, hide tanner, muralist, curator, and advocate for the lands and waters. She is a graduate of Lakehead University in the Fine Arts program and in the past couple of years she has worked as coordinator for The Indigenous Food Circle and The Solidarity Collective. Through involvement with community-engaged organizations and projects, she uses multi-disciplinary mediums to express and share her holistic feelings focused on Land, water and all the spirits that call it their home.*

Miigwech

Alexa Lesperance

Masaabikwe ndzhinikaaz
Makwa ndoodem

Community

Rocky Bay First Nation (Robinson-Superior Treaty), band member of Whitefish Bay First Nation (Treaty 3).

Graduation Year:

2020

Tell us a little about your journey to medicine.

"My interest in family medicine began as a young girl living on reserve and volunteering at our health centre. Among the many barriers to health care for Indigenous people, the most obvious that I encountered was access. Growing up on reserve, I rarely encountered physicians, but always saw the need."

Who was your biggest inspiration growing up?

"I was inspired by my papa, a traditional medicine man who helped people from his heart. I admired the way he gained the trust of others and could help people when they needed it the most."

Name two activities that you enjoy doing the most.

"Activities that I enjoy doing the most is harvesting and gathering traditional medicines and reading."

Alison Lewis

Community

Dryden

Graduation Year:

2022

Tell us a little about your journey to medicine.

"I always liked science as well as working with people. I never planned on being a doctor, but I knew there was a huge need for family physicians in Ontario. I didn't want to leave northern Ontario for school, so I was glad when I found out there was a medical school in Thunder Bay. I applied to med school after completing my undergrad degree in Biology and Chemistry."

Where are you now?

"I am currently working as a family medicine resident based in Dryden, Ontario. I love the challenges and diverse presentations in rural family medicine!"

What is some advice you have for Indigenous youth who may be interested in medicine as a career?

Always follow your interests and gain experience doing things you enjoy. Being well rounded will help you in medicine and when you are passionate about something it will show.

Jamie Thompson

Community

Métis from Fort McMurray, AB

Graduation Year:

2024

Quote to share with Indigenous Youth.

"Whatever you end up contributing to the world, know you're making your ancestors proud."

Tell us a little about your journey to medicine.

"I went to university in Ottawa to study biomedical sciences and Indigenous studies and am now about to graduate from medical school in 2024."

What is your favourite part of what you do?

"Getting to make a difference in people's lives and help them navigate our complex medical system."

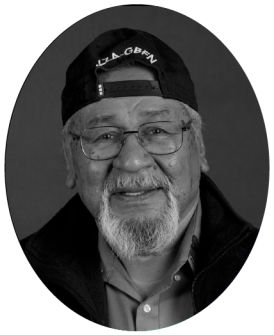
Who was your biggest inspiration growing up?

"My grandmother and her plant medicine knowledge."

What is some advice you have for Indigenous youth who may be interested in medicine as a career?

"Reach out & find supports to help you through. Talk to doctors in your community or online that you admire and ask tons of questions. You can also reach out to the Indigenous Students' services at your university, to the Indigenous Medical Students' Association of Canada (IMSAC), or the Indigenous Physicians' Association of Canada (IPAC) for possible mentorship."

Gene Nowegejick



Title

NOSM University Elders Council

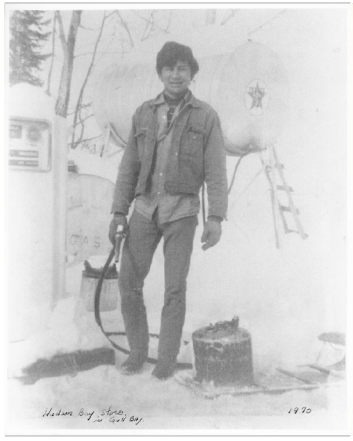
Community

Kiashke Zaaging Anishinaabek

Gene Nowegejick is a member of the Kiashke Zaaging Anishinaabek. He is a parent, grandparent, and great grandparent. He grew up traditionally and learned from his family, he is from the Lake Nipigon peoples. Gene's grandfather is a direct descendent of one of the signatories to the Robinson Superior Treaty of 1850. He has relations at Fort William First Nation, Biinjitiwaabik Zaaging Anishinaabek, and Grand Portage.

Gene attended Residential School and like many of his generation he had negative experiences that he overcame. At age 23, Gene made the decision to quit alcohol and drugs and found his way to rediscovering a traditional way of life, learning how to dance at a pow-wow, participate in ceremony, run a sweat lodge and fasting.

Guided by the Medicine Wheel and the Seven Grandfather Teachings, he learned to turn the negativity in his life into a positive. Gene tells us, education is key to understanding the dark history of our people and we must recognize the price they have to pay for the freedom we enjoy today. Seeing Anishinaabe people achieve what they have today gives him contentment.



Ryan McConnell

Community

Mohawks of the Bay of Quinte

Graduation Year:

2023

Quote to share with Indigenous Youth

"Do not go where the path may lead. Go instead where there is no path and leave a trail"
– Ralph Waldo Emerson

Tell us a little about your journey to medicine.

"My interest in medicine began the moment I learned that my community did not have a doctor as a young child. I first applied to NOSM University in 2017 and was eventually accepted in 2019 on my third try! I obtained an undergraduate degree at Queen's University in Physical & Health Education (2017) and a Master's degree in Public Health at Western University in (2018)."

Where are you now?

"Completing my Family Medicine residency through Queen's University in Belleville, Ontario (10 minutes away from my community)."

What is your job and what does a typical day look like?

"The scope of practice in Family Medicine is very unique, providing me with opportunities to care for patients of all ages and stages of life who have a wide variety of health issues."

Who was your biggest inspiration growing up?

"My Dad."

Name two activities that you enjoy doing the most?

"Hockey and Golf."

Name two activities that you enjoy doing the most?

"Never give up! Many of my classmates (including myself) were not accepted to medical school on our first try. If you don't succeed on your first try and medicine is the path you hope to take, give it another go! You can do it!"

SCIENCE ACTIVITIES

SCIENCE NORTH SCIENCE NORD

Intro to Micropipetting

You might have used a transfer pipette before – as you squeeze the bulb at the top, liquids are drawn in and out of the pipette. This makes them great for squirting, but not for precision!

It is very important to precisely measure the volume of liquids in laboratory research and medical testing. Accurate measurements make the results of experiments reproducible, comparable, and cost-effective!

We need special tools to accurately measure very small volumes. Labs all over the world use micropipettes. These pipettes can measure liquids from 0.5 to 15000 microliters (µl). To put this number into perspective, a teaspoon is equal to 5000 µl and the experiments below use around 200 µl or 1/25 teaspoon of liquid.

In the lab, small tests are usually run on a 96 well plate. Many tests are done at once, and standards are used to make sure the results are consistent. The plate can be put into a reader that analyzes the plate by measuring a specific colours or reflections.

How to use a Micropipette

Try this out without any liquid to start!

1. How to hold the pipette

- Hold the pipette vertically, with the black cone tip of the pipette pointing towards the ground.
- Find the curved grippy on the top of the main barrel of the pipette.
- Hook the grippy over your pointer finger on the inside of your hand.
- From here, you should be able to easily close your hand around the pipette and your thumb should be able to easily press the plunger and ejector.
- Try to hold the pipette vertically!

2. Set the volume

- Slowly turn the plunger knob left and right. This will make the number in the black window go up and down, which changes the volume that the pipette is set to.
- As the volume goes up, the plunger goes higher to push out more air.
- Try not to go to much over 200 µl or below 20 µl - this can damage the pipette!

3. Put on a tip

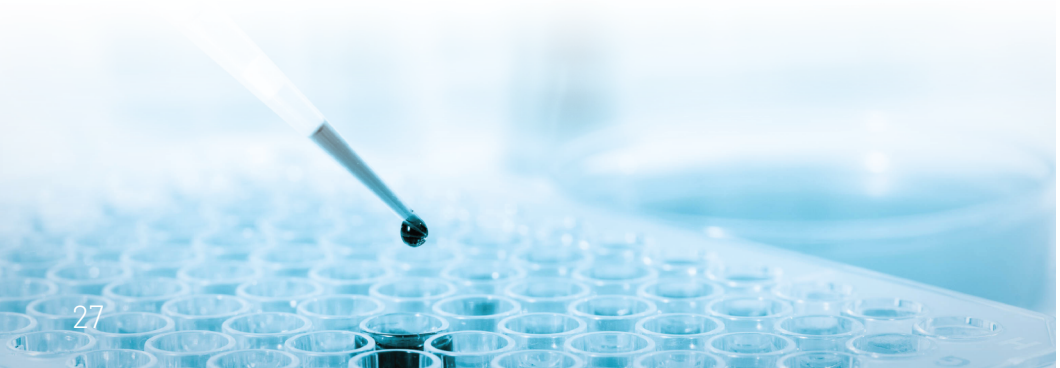
- *The black cone tip of the pipette should never go into liquids.*
- *Liquid inside the pipette could cause damage, contamination and change the calibration.*
- Liquid stays inside the disposable pipette tip.
- Open the tip box and press the cone tip of the pipette firmly into a disposable tip.

4. Using the plunger

- Press the plunger up and down a few times, there are two stops:
  - Half-way- this is for drawing up exact amounts of liquid
  - All the way down- this is for blowing out all the liquid in the tip.
- Practice feeling the half-way stop a few times and at different volumes before trying this with water.
- How to draw up liquid
  - Gently push down the plunger to the half-way stop.
  - Pushing out the air before putting the tip in the liquid reduces bubbles.
  - Put the yellow tip of the pipette a few millimeters into the liquid, do not go so deep that the black cone tip is under water!
  - Slowly release the plunger and draw up the liquid.
- Express the liquid.
  - Place the pipette tip where you want the liquid to go.
  - Slowly push down the plunger to the half-way stop.
  - Raise the pipette tip out of the liquid and push the plunger all the way down.

5. Eject the tip.

- To avoid contamination, we can change tip when changing liquids.
- If the same liquid is being pipetted repeatedly, you can continue using the same tip.
- Put the pipette tip over a waste cup and press down on the ejector.
- If it is really hard to eject the tip, this might mean that the tip was on too tight



Experiment 1: Practice Pipetting

Practice micropipetting using water! The main goal of this experiment is to get comfortable using the pipette, setting the volume, moving small amounts of liquid and seeing the small differences in volume.

Set Up:

1. Fill one cup with water and leave the other cup empty. The empty cup will be filled with used pipette tips.
2. Take out the 96 well plate, tip box, micropipette and tube rack.
3. Find the tubes containing magenta, blue, and yellow food colouring and place them in your tube rack.

Part 1: (Practice Moving Water)

1. Place the 96 well plate over the Colour Mixing Water template. Make sure the plate is facing the right way, and that the ABC columns and 123 rows line up.
2. The first well (E1) will hold 100 µl of water.
   - Set the pipette to 200 µl.
   - Put a fresh tip onto the pipette.
   - Draw up 200 µl of water.
   - Express the water into well A1.
3. Repeat for all wells labeled 100 µl.
4. Adjust the volume to 160 µl. Repeat Step 1 and Step 2 to for all the wells labeled 160 µl.
5. Eject the tip into the used tip cup.

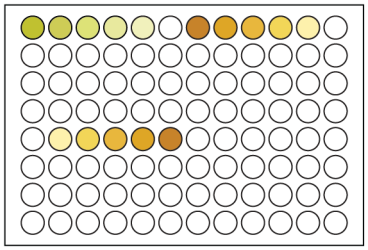
Part 2: Move the Food Colouring

1. Place the 96 well plate over the Colour Mixing Yellow template. Make sure the plate is facing the right way, and that the ABC columns and 123 rows line up.
2. Open the yellow food colouring. It should be on the tube rack!
3. The wells A7 and E6 will hold 100 µl of yellow food colouring.

- Set the pipette to 100 µl.
- Put a fresh tip onto the pipette.
- Draw up 100 µl of yellow food colouring.
- Express the yellow food colouring into wells A7 and E6.

4. Wells A8 and E5 will hold 80 µl of yellow food colouring. Adjust the volume to 80 µl and repeat Step 3 to place 80 µl of yellow food colouring into those wells.
5. Repeat for the rest of the yellow wells:

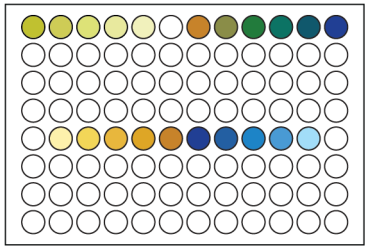
Colour Mixing: Yellow



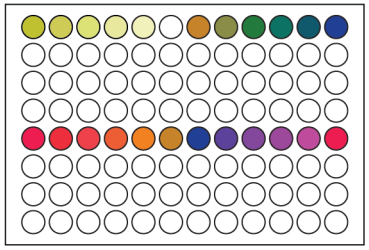
- 60 µl yellow in A9 and E4
- 40 µl yellow in A10 and E3
- 20 µl yellow in A11 and E2

6. Eject the tip into the used tip cup.
7. Use the Blue and Magenta templates to fill each well with the proper volume of each colour based on their template.

Colour Mixing: Blue



Colour Mixing: Magenta



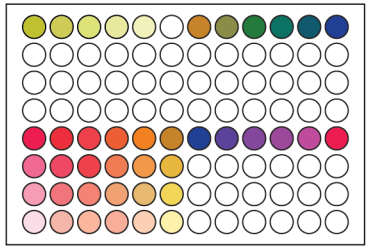
Part 3: Mixing and Dilutions

1. Place the 96 well plate over the Colour Mixing Orange template. Make sure the plate is facing the right way, and that the ABC columns and 123 rows line up.
2. The first orange well says mix 100 µl in 1E:

- Set the pipette to 100 µl.
- Put a fresh tip onto the pipette.
- Draw up 100 µl of well 1E slowly and expel it back into the well.
- Repeat 3-4 times.
- Expel the contents of pipette completely by pushing the plunger all the way down.

3. Well 1F says 20 µl of E1, this is a new serial dilution.
   - Adjust the pipette to 40 µl.
   - Take 40 µl of liquid from 1E.
   - Pipette the 40 µl into F1.
   - Mix by pipetting up and down several times.
   - Because being taken in and out is smaller, it will take a bit more times up and down to mix this thoroughly.
4. Dilute the rest of the column by mixing:
   - Mix 40 µl of 1F into 1G
   - Mix 40 µl of 1G into H1
   - This is called a 10 percent serial dilution because 20 µl is 10 % of 200 µl.
5. Change pipette tips.
6. Repeat this process of:
   - Mix well E2 thoroughly
   - Mix 40 µl of E2 into F2
   - Mix 40 µl of F2 into G2
   - Mix 40 µl of G2 into H2
7. Complete the serial dilutions following the volumes on the template for:

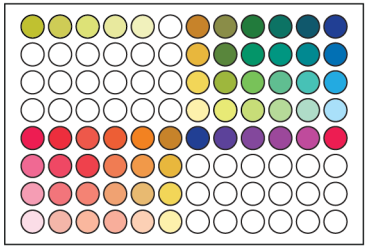
Colour Mixing: Orange



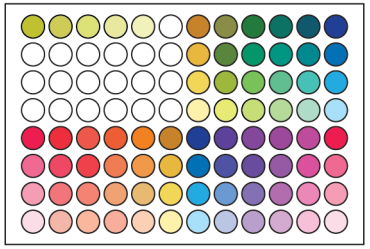
- E3 to H3
- E4 to H4
- E5 to H5
- E6 to H6

8. Repeat Step 1 – Step 7 to mix the Green and Purple Colour Mixing templates, follow the volumes and wells indicated on the template

Colour Mixing: Green



Colour Mixing: Green



Part 4: Pipetting Art

1. Take out a sheet of water colour paper.
2. Set the pipette to different volumes and try pipetting the colours you mixed onto paper. How does volume change the size of the dot you make?
3. Try to make a picture or a pattern!

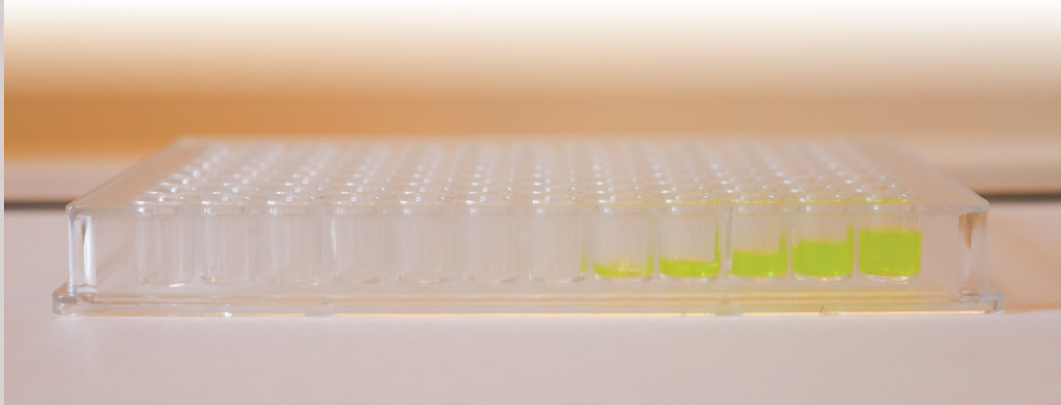
Part 5: Clean Up

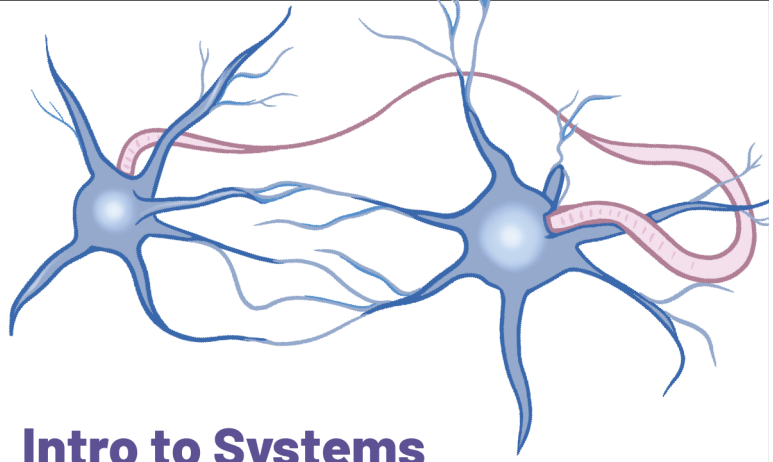
In a real laboratory setting, the tips and the 96 well plates are only used once. This is to avoid contamination and ensure consistent test results. When learning, we do not need to be so careful. So we are going to wash and reuse the plates and tips.

- Run the 96 well plate under water and rinse very well. If some colour remains, let it soak in water for a while or use a cue tip to clean out the well. It is clean when you can no longer see any colour at the bottom of the wells when held up to a light. The plate air dry before using it again.
- Fill the used tip cup with water and shake it around. Change out the water and repeat until most of the tips are clear. Some tips might need to be run under water individually.
- Put the used tips back into the tip box and let air dry, some tips might need to be touched to paper towel to draw out the rest of the water.

Tips and Suggestions

- Try not to stick the pipette tip into the liquids already in the well if you are reusing the tip.
- Pay close attention to the well and volume on the template.
- If you cannot read what goes into the well, carefully take the 96-well plate off the template to see the instructions.
- Remember not to set the micropipette below 20 µl or above 200 µl.
- Try mixing colour on the paper, you can also mix new colours in the extra wells!
- Changing tips between colours prevents contamination!





Intro to Systems

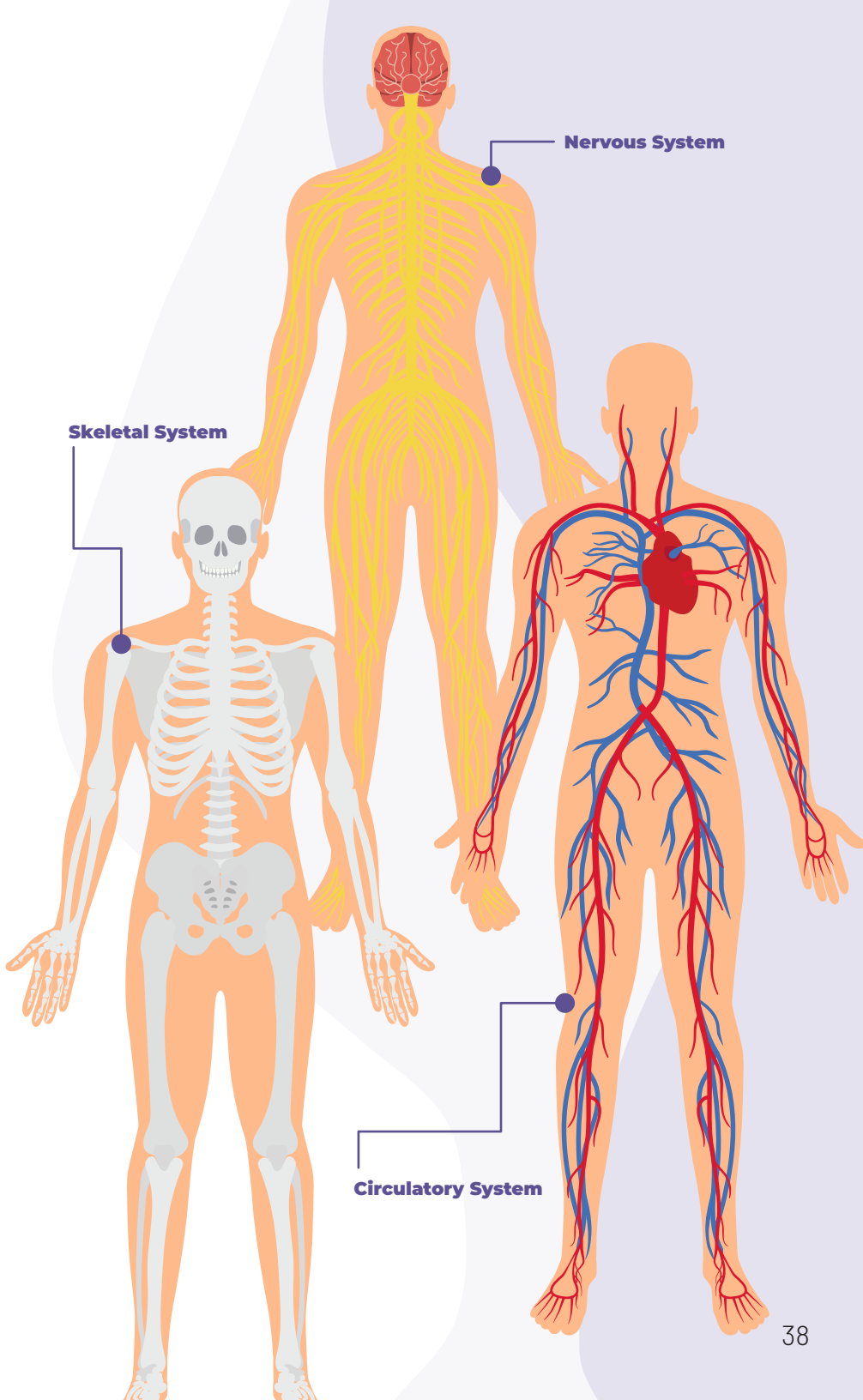
There are eleven organ systems found in the human body. The organs in each of these systems work together to let you breathe, digest food, fight diseases, move, and so much more!

The following experiments will let you take a closer look at three organ systems:

- **The nervous system** is made up of two parts. The central nervous system includes the brain and spinal cord, and the peripheral nervous system includes all the nerves that branch off from the spinal cord to the rest of the body.

- **The circulatory system** pumps blood from the heart to the lungs to pick up oxygen. The heart sends oxygenated blood through arteries to the rest of the body, and the veins carry oxygen-poor blood back to the heart to repeat the process.

- **The skeletal system** acts as the body's central framework. It is made of bones and connective tissue, including cartilage, tendons, and ligaments. Examine the three internal layers of your surgery bear and identify each system!



Experiment 1 : Suturing Surgery Bears

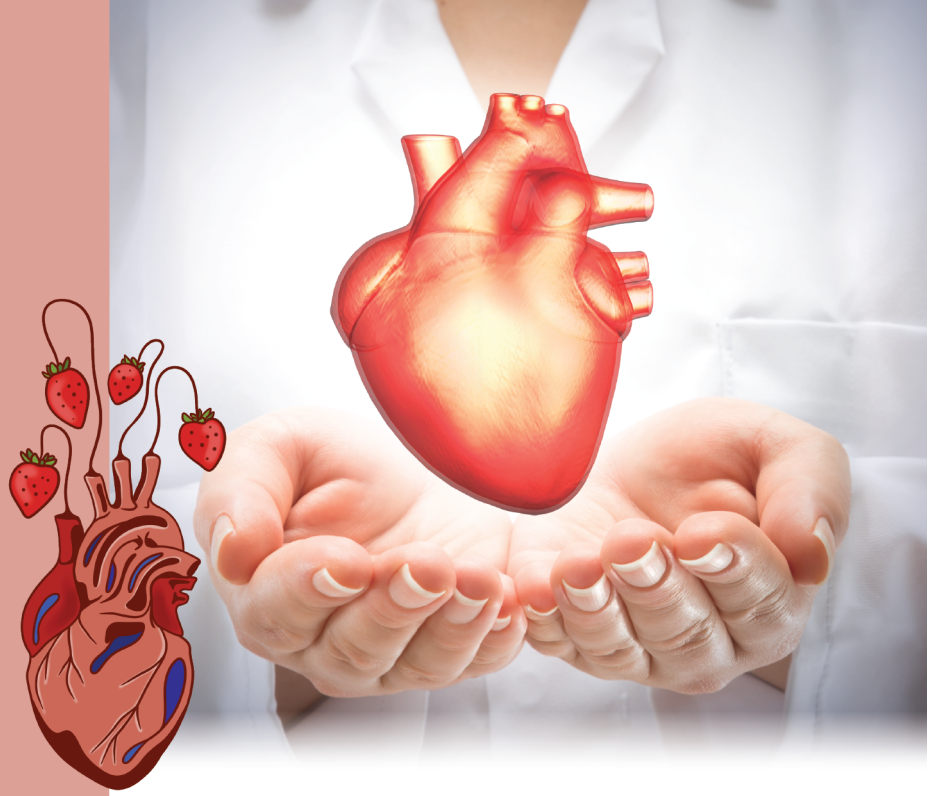
In this experiment, you will be creating sutures on your surgery bear. Doctors use sutures on large wounds that will not heal properly on their own. These sutures are made using suture material (a needle attached to a length of thread), and they give skin and other tissues the time and stability that they need to heal.

Doctors can use one of four stitching techniques:

- Continuous sutures use a single strand of suture material to close the wound.
- Interrupted sutures use several strands of suture material to close the wound. After a stitch is made, the material is cut and tied off.
- Deep sutures are placed under layers of tissue, deep below the skin. They can be continuous or interrupted.
- Buried sutures are tied so that the suture knot is found under or within the area that is to be closed off.

How to Create the Sutures

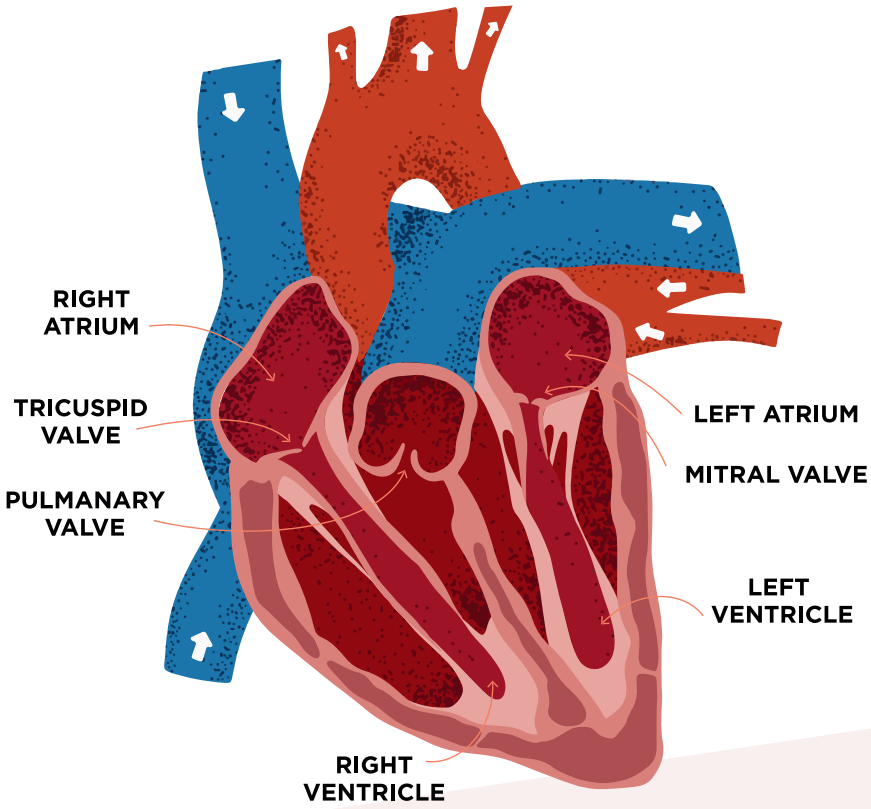
1. Cut a two-arm-length piece of embroidery string.
2. Thread the piece of the string through your needle and tie a secure knot.
3. Put on your gloves. Gloves are very important because they help keep germs away from patients and help doctors hold the needle securely.
4. Prepare your bear. Layer your bear with the three coloured systems sandwiched between the front and back brown bear pieces.
5. Choose your stitching technique and begin stitching around the edge of your bear, putting a stitch in each hole provided. Make sure that each of the five pieces are lined up!
6. You can either sew your entire bear up or stitch half of it, allowing you to reopen the bear while leaving the sutures in.



Intro to the Heart

The human heart has four chambers in it, two ventricles and two atria. As a heart beats, the first atria squeezes blood through one-way valves and into the ventricles. These valves close as the ventricles begin to contract, forcing open two different one-way valves. This second set of valves lets blood (and oxygen) into the rest of your body.

HEART ANATOMY



Experiment 1: Major Pulse Points

When your heart pumps blood, it creates a pressure wave that moves blood through your arteries. You can feel this pressure by pressing your fingers over specific spots called pulse points.

There are four major pulse points on your body. Let's see if you can feel them!

1. **The radial pulse** can be found on your wrist. Flip your wrist so it is palm up and then press down over the radial artery. It should be on the same side as your thumb!

2. **The carotid pulse** can be found on your neck. Find the bony feeling voice box in the center of your neck and slowly press down on either side of it. Make sure you only press down on one carotid artery at a time!

3. **The apical impulse** can only be found in about half of all adults. To find your apical impulse, gently press down at the fifth spot between your ribs on the left side of your body. If you are having trouble feeling it, try using the stethoscope instead of your fingers! You can also use the stethoscope to listen to your lungs and intestinal tract.

4. **The posterior tibial pulse** is found in your lower leg. Look at your ankle on the side of your big toe. Reach just underneath the bony part of the ankle and feel your posterior tibial pulse.

Experiment 2: Practice CPR

If your heart stops beating, it cannot carry oxygen to the rest of your body. Doctors call this phenomenon cardiac arrest, or a heart attack. It can result in loss of consciousness, serious brain damage, and even death!

If someone you know thinks they are having a heart attack, or if you find someone unresponsive without a pulse, you should seek medical attention immediately. While you wait for help you may choose to perform cardiopulmonary resuscitation (CPR). CPR allows you to squeeze and pump someone's heart from outside their body to push oxygen through their blood.

1. Make sure the area around you is safe. You want to make sure that the person has not been knocked unconscious by something that could hurt you too!
2. Try to wake the unconscious person and check for their pulse.
3. If you cannot wake them up, call for help. If you cannot feel their pulse, continue to step 4.
4. Make sure the unconscious person is lying on a firm surface.
5. Go on your knees beside the person's chest.
6. Place your hands in the middle of their chest, with one hand on top of the other.
7. Lock your arms and push down hard. Use your body weight to compress their chest by 5 cm!
8. Let their chest recoil back up.
9. Repeat! Try to do 100-120 compressions per minute – it may help if you start singing a song like Staying Alive by the Bee Gees.

Practice CPR on the compression device!

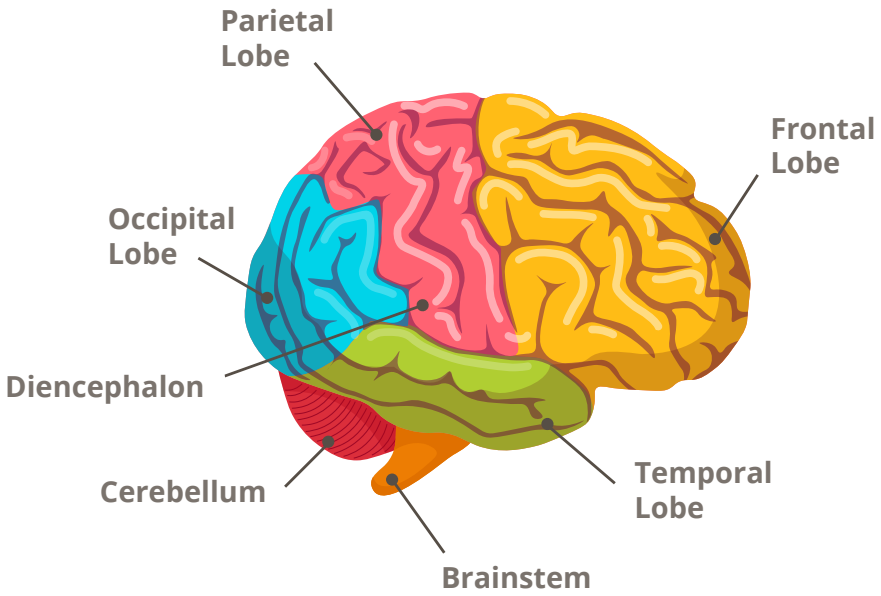
1. Lock your arms and hands.
2. Use your body weight to push down on the compression device.
3. Let the compression device recoil back up.
4. Repeat for one minute, to the beat of Staying Alive!

Intro to the Brain

The brain acts as the control center of the body. It receives and processes information from the five senses, generates thoughts and meaning, controls movement, creates emotional responses, controls unconscious movements like breathing, and so much more!

When people think about the brain they usually picture a wrinkly, squishy blob called the cerebrum, but this is just one part of it! There is also the diencephalon, the brainstem, and the cerebellum.

THE HUMAN BRAIN



Experiment 1: Brain Hat

The cerebrum holds two hemispheres (the right hemisphere and the left hemisphere), and each hemisphere can be split into four lobes:

- **The frontal lobe** controls conscious and abstract thoughts and holds memories about facts and events. It also controls emotional and cognitive processes, and the muscles that we move by choice.
- **The parietal lobe** processes information from our eyes and helps us understand and navigate three-dimensional environments. It also controls our conscious feeling of pain and pressure, taste, temperature, touch, and vibration.
- **The temporal lobe** processes information from our nose and ears, and stores long-term memories about smell, speech, and things we have seen.
- **The occipital lobe** receives information from the temporal and parietal lobes to make sense of the things we see.

Use the insert page to make a brain cap and explore the four lobes of the cerebrum!

1. Cut around the outside edge of your brain.
2. Cut the solid, straight black lines to create flaps.
3. Tuck the flaps under the image until the dashed line meets the solid line.
4. Glue or tape the tucked paper into place.
5. Tape both sides of the brain together.

Experiment 2: Concussion Goggles

A hard hit to the head can make your brain bounce against the inside of your skull, which makes the neurons inside it leak and create a "bruise". Sudden twists and shakes can also make your brain swirl and tear inside your skull. Both injuries will cause a concussion because the brain is trying to repair actual damage while making sense of signals that have been "shaken up".

Experiment 3: Inversion Goggles

Did you know that your eyes are technically curved? As light hits your cornea, it is bent. This bending creates an upside-down image on your retina, which is relayed to your brain through the optical nerve. Your brain uses this message and other balance signals coming from your inner ear to decide when to invert the image. Inversion goggles allow you to see the images that are hitting your retina and allow scientists to study human visuomotor adaptations!

Healthy Eating, Healthy Bodies

Eating nutritious food is one of the easiest ways to keep your body healthy! Check out these resources to learn more about food programs in your community:

- Matawa: Where to Get Food in Thunder Bay (2023): http://www.matawa.on.ca/wp-content/uploads/2022/12/Where-to-Get-Food-in-Tbay-2023-Final.pdf
- The Good Food Box, Thunder Bay: https://www.goodfoodboxtb.org/
- Healthy Eating and Food Safety for Indigenous Peoples: https://www.sac-isc.gc.ca/eng/1581522106156/1581522147811
- Gifts From Our Relations: Indigenous Original Foods Guide: https://nada.ca/wp-content/uploads/NIDA_TRADITIONAL_FOODS_GUIDE-2019-English.pdf

Handwashing is the best way to stop the spread of infection! There are two ways to wash your hands:

1. With soap and running water.
   a. Wet your hands with running water, turn off the tap, and apply soap.
   b. Rub your hands together to create a lather. Lather the backs of your hands, between your fingers, and under your nails.
   c. Scrub your hands for at least 20 seconds or hum the "Happy Birthday" song twice.
   d. Rinse your hands well under running water.
   e. Dry your hands using a clean towel or air dry them.
2. With hand sanitizer.
   a. Apply sanitizer to the palm of one hand (read the label to learn the correct amount).
   b. Rub your hands together.
   c. Rub the gel over all the surfaces of your hands and fingers until your hands are dry. This should take around 20 seconds.