STEAM Tales

Lesson plans

Rita Levi-Montalcini

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Rita Levi-Montalcini's biography

Picture credit: Wikipedia https://en.wikipedia.org/wiki/File:Rita_Levi-Montalcini_bandw.jpg

Rita Levi-Montalcini (22 April 1909, Turin, Italy – 30 December 2012, Rome, Italy) was an Italian Jewish neurobiologist.

She attended the Medical School at the University of Turin, where she remained as her professor's assistant after graduating summa cum laude in 1936. Her academic career was cut short by Benito Mussolini's 1938 Manifesto of Race. During World War II, she conducted research on chicken embryos in a makeshift laboratory at her home. It was during this time that she made her groundbreaking discovery of the **Nerve Growth Factor** (NGF), a protein that stimulates the growth and survival of nerve cells. After the war, Levi-Montalcini continued her research at Washington University in St. Louis, Missouri, where she collaborated with Stanley Cohen to further study NGF. Their work led to a deeper understanding of how nerve cells develop and function, which had profound implications for neuroscience and medicine.

In 1986, Levi-Montalcini was awarded the Nobel Prize in Physiology or Medicine, along with Stanley Cohen, for their discovery of NGF. Throughout her career, she received numerous awards and honours for her contributions to science and medicine. Beyond her scientific achievements, Levi-Montalcini was also known for her advocacy for women in science and education. She remained active in research and public engagement until her passing on December 30, 2012, leaving behind a legacy of groundbreaking discoveries and a commitment to advancing scientific knowledge.

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Lesson plan 1

Homemade Microscope Keywords: microscope, optics	
Duration: 55 min	**Age:** from 6 to 9 years old
Place: Classroom and meadow	**Related STEAM areas:** **S** (Science): Children will observe organic and inorganic samples, and they will learn about optics, light, and magnification principles. **E** (Engineering): Children will practice design thinking, understanding materials, and constructing a functional tool.
Description	During this experiment, children will construct a simple homemade microscope using common materials. They will explore the basic principles of magnification and observe various specimens. Initially, children will observe a real microscope and analyse its components. Then, they will replicate its four main parts: **1.** The light source to illuminate the sample

	2. The stage to put the sample sealed between two thin slices **3.** The lens to magnify the sample **4.** The eyepiece They will use a plastic square and a drop of water as a magnifying lens and the eyepiece at the same time. The magnification won't be as big as in a real microscope but it will still magnify the light that will come through. With their homemade microscopes, children can explore various specimens like pieces of plants, fruits, vegetables, insects, or soil fostering their curiosity and scientific inquiry.
Learning objectives	At the end of this experiment, children will be able to: • Develop construction skills and the ability to follow step-by-step instructions by building a simple homemade microscope. • Understand the significance of microscopes in science and identify their key components.

	• Learn the basic principles of magnification and how it enhances observation.
Connection to the female role model	During the period of the fascist regime, Rita conducted her research on chicken embryos in an improvised home laboratory. The microscope was a key instrument in her work. To simulate the spirit of resourcefulness and give a clearer idea of what Rita's work was about, children will be constructing and experimenting with a homemade microscope using commonly available materials. They will collect and investigate different specimens encouraging curiosity and hands-on learning in science.
Individual or group	Individual or in groups.
Safety	This experiment is safe to perform.
Materials	☐ Glass jar ☐ Flashlight ☐ Transparent plastic (such as from an empty plastic box or container) — you'll cut out two thin square pieces, approximately 5x5 cm each, to hold the sample securely between them (sample holder). ☐ Transparent plastic (such as from an empty plastic box or container) — you'll cut out one thin square piece, approximately 8x8 cm, to hold a drop of

	water (lens holder). ☐ Sample (such as leaves, moss, flowers, a dandelion clock, tree needles, hair (maybe of different colours, from each child, salt/pepper/sugar, mould (first grow mould on a slice of bread by closing the bread in a covered vase for 14 days) ☐ A small amount of water Optional: Cotton swabs, two equal pens or chopsticks to hold the lens
Lesson plan	
Introduction (10 min)	Do you know how scientists can see and investigate in detail very tiny objects and living things? Right, they use a microscope! Have you ever wondered how a microscope is made and how it works? Do you think it's possible to build a microscope at home? Today, you'll find out how to make one. You'll learn about the main parts of a microscope and use nature's very own magnifying lens – a drop of water – to look at samples you collected up close. **If you read the story before the experiment:** Do you remember Rita's story? During the time of the fascist regime, she wasn't allowed to work at the university. But she didn't give up and to keep doing her research,

	she turned her bedroom into a little lab. She used everyday things like sewing needles and scissors to create the tools she needed. One of the most important tools she used to study neurons was a microscope.
Research question/hypothesis (5 min)	Rita was an excellent researcher. And what do researchers and scientists do? They observe attentively, collect data and ask themselves a lot of questions, and they search for answers. Let's explore together! We'll take a close look at the microscope and try to describe its parts and figure out what each one is used for. Show the children a real microscope if you have one at school or a picture or a short video of a real microscope. Encourage them to observe it carefully. Let them describe what they see and what the parts serve for. They can also try drawing a simple outline of the microscope to plan the construction. Then ask: Have you ever wondered how a microscope can make tiny objects look bigger? It's all thanks to a special part called the lens – the **magnifying lens**!

	What do you think we will be able to see with our homemade microscope? (The teacher can make a list of children's answers and check them at the end of the experiment).
Step-by-step instructions (30 min)	**PART 1: COLLECT SAMPLES** Prepare samples to examine under the microscope by collecting items such as leaves of different colours, petals, sand, etc. Prefer samples that are not too dark or large, ensuring they fit under the lens. Choose thin specimens that allow light to pass through easily, providing the best possible observation experience. Make sure you have enough samples for all children in your class. **PART 2: ASSEMBLING THE MICROSCOPE** **Step 1: Set the stage** ➢ Place the glass jar on a desk with bottoms up to serve as a stage where you will put your sample. ➢ Install the flashlight inside the jar to shine upwards through the jar to illuminate your sample. If the light from the flashlight is too bright, you can put the flashlight on the side of the jar and place a piece of aluminium foil in the jar under an angle so that the light reflects the top (which in this case is

	the bottom) of the jar. **Step 2: Prepare the lens holder and slides** To create the holder and the slides you can use an empty plastic box or container. ➢ Children should first measure and mark two squares (approx. 5x5 cm) and one larger square (8x8 cm). ➢ They should cut out with scissors all three squares. ➢ Cut a hole (0,5 cm diameter) in the middle of the bigger square which will serve as the lens holder. You can use a hole punch or manicure scissors. ➢ Finally, pour a small amount of water on the lens holder in order to fill the hole with a drop (it may take a few attempts to make the water stay inside the hole). **Step 3: Insert the sample** ➢ Take the two smaller slides and place your sample on one of them. Use a cotton swab to do so in case of liquid or semi-liquid samples (such as mud). You can add a drop of water and seal it with the second slide. ➢ Put the sealed slide on the stage and switch the flashlight on.

	Step 4: Observe ➢ Finally, take the lens with the waterdrop lens and hold it right up to your eyeball and try to look straight at that water droplet. ➢ Approach your sample, and as you get close, you should see the sample magnified. ➢ Adjust the distance between your eye and the sample by moving your head to find the best focus. ➢ You can help yourself by placing two pens (or chopsticks) on the jar to achieve a good height of the lens above the sample. Now your homemade microscope is ready! Let's have a closer look and observe what is happening. Can you see the structure of your leaf? Is something moving in the soil?
Source	**Instruction video:** "Make a FREE Microscope! (DIY With a Water Drop Lens)" by Squint Science
Conclusion (5 min)	Congratulations! You have successfully built your own homemade microscope and explored the fascinating world of magnification using simple materials. Now, check the research question: "What do you think we will be able to see with our homemade

	microscope?" by asking children what they actually see. Discuss how the children's answers differ after the conclusion of the experiment. Do you know why the objects under the water drop appear bigger? How much bigger will appear samples under a real professional microscope?
Explain the experiment (5 min)	Through this experiment, you've learned how microscopes work and now you know that the magnifying lens (in our case, a water drop) makes tiny details of objects visible by bending light. With a real professional microscope, samples can appear hundreds or even thousands of times bigger than their actual size. In science, different types of microscopes are used, such as: **Light Microscopes**: These are like the ones you might use in school but much stronger. Scientists use them to look at things like cells, bacteria, and tiny organisms. **Electron Microscopes**: These are super powerful and can magnify things up to 10 million times. Scientists

	use them to examine viruses, atoms, or the structure of materials. **Stereomicroscopes:** These are used to see objects in 3D, like insects or small plants, and are great for exploring the surface of things.
The science behind	Finally, let's look into the science behind what we just did with the microscope and analyse its parts and their purpose. **The stage with the slides** The slide held the sample. It kept everything in place so we could focus on it without it moving around. **The light source to illuminate the sample** The flashlight providing light is very important because, without light, it's hard to see anything clearly. By shining light through the sample, we could see even the tiniest structures, like the veins in a leaf or grains of sand. **The eyepiece and the lens** During our experiment, you noticed how a drop of water can make things appear bigger when you look them through it. That's because the water acts like a

	tiny **magnifying glass**. A magnifying glass is a **curved piece of glass** or plastic that bends light. When **light bends**, it makes objects look much bigger than they really are, which helps us see tiny details. In our experiment, the water droplet became the lens. It bent the light coming from the flashlight, making the small details of our samples look bigger. This principle is called **magnification**.

Lesson plan 2

Five senses exploration kit **Keywords: senses, sight, hearing, smell, taste, touch, nervous system**	
Duration: 70 min	**Age:** from 6 to 9 years old
Place: Classroom, outdoors to collect samples	**Related STEAM areas:** **S** (Science): Children will be introduced to the nervous system and its function in perceiving the world around them. **A** (Arts): Creative realisation of the kit.
Description	In this experiment, children will explore how the nervous system enables us to perceive and interact with the world by exploring their five senses—sight, hearing, smell, taste, and touch.
Learning objectives	At the end of this experiment, children will be able to: • Name the five senses (sight, hearing, smell, taste, and touch) and describe how each helps them perceive the world around them. • Understand the role of the nervous system in sensory perception through their senses.

Connection to the female role model	Rita Levi-Montalcini dedicated her life to neurobiology research, focusing on nerve cells and fibres. Her most significant achievement was discovering the Nerve Growth Factor (NGF). While her research might be too complex to explain to small children fully, we can help them understand the broader purpose of her work. By highlighting how the nervous system allows us to perceive and interact with the world around us, we can give them a better idea of the importance of her discoveries.
Individual or group	Optional: individual or in groups.
Safety	This experiment is safe to perform. However, ensure children have clear boundaries while collecting objects outdoors and demonstrate the proper use of tweezers and magnifying glasses beforehand.
Materials	☐ An empty paper box (e.g., from cereals) for each child ☐ Printed senses checklist for each child ☐ Glue ☐ Coloured paper (for decoration) ☐ Coloured pencils or crayons for each child ☐ Post it (5 for each child)

	☐ Magnifying glass ☐ Tweezers ☐ 5 plastic sheet protectors/zip bags for each child
Lesson plan	
Introduction (5 min)	You surely know that we have five senses: sight, hearing, smell, taste, and touch. They help us explore and understand the world around us. In this experiment, we will investigate different objects from nature. By collecting and analysing items like leaves, stones, and flowers, we will discover how each sense provides unique information and how they work together. We will also learn about the nervous system and its role in processing sensory information about the world around us.
Research question/hypothesis (5 min)	Before starting our experiment, ask the children to discuss the following research questions. You will have the opportunity to examine and confirm or correct their responses at the end of the experiment using concrete objects as examples. How do we use our senses to explore the world around us? Can we identify objects correctly by using only one

	sense at a time or are our observations more precise if we employ more of them? Which of the five senses is the most useful when exploring different types of objects?
Step-by-step instructions (45 min)	**Before the experiment**: teachers should print a checklist **Step 1: Decorate your kit** First, the children will decorate a paper box and attach a checklist of the five senses. (This can be done either in class or at home with their parents, saving time during the lesson and encouraging family involvement.) To begin, children will cover the box with a wrapping paper of their choice, either plain or decorative. In this step, children can unleash their creativity. They can then personalise it by adding stickers or drawing their own pictures. **Step 2: Prepare a checklist** Teachers will use the attached checklist template to help children connect sensory organs with their corresponding senses and perceptions. It will be

	printed in advance by the teacher and distributed to the children who will glue it on the top of the box, serving as a reminder of the senses to use during the exploration. Children can colour the drawings. The teacher will briefly explain what each organ in the picture does for our senses and how it contributes to our perception of the world. ☐ Sight (Vision): what I see ☐ Hearing (Audition): what I hear ☐ Smell (Olfaction): what odours I smell ☐ Taste (Gustation): Can I taste it? How does it taste? ☐ Touch (Tactile): What do I feel on my skin? Pressure, temperature, structure… **Step 3: Prepare post-its** Each child will receive 5 Post-its and will be instructed to draw one of the five sensory organs on each Post-it: a hand (for touch), a nose (for smell), an eye (for sight), an ear (for hearing), and a mouth or tongue (for taste). After completing the drawings, the children will place their post-its inside the box, along with plastic bags and any other instruments provided. These materials will be stored in the box for use later in the activity.

	Step 4: Go outside and collect objects Take the children to the school garden or a park, where they will search for and collect objects to examine through their senses. Explain to the children that they will be exploring the environment to collect various objects (like leaves, stones, flowers, etc.) and examine them using their senses. To imitate serious scientific work, they can use a magnifying glass or tweezers to place the samples in plastic sheet protectors or zip-lock bags. Children will then store the objects in the box, checking off the senses involved in the examination on the checklist. For each object, the children should also choose the sense they feel was most important in their observation (e.g., for a soft leaf, touch might be the main sense). They will then take a post-it with the drawing of the relevant sensory organ (hand for touch, eye for sight, etc.) and stick it onto the zip-lock bag or sheet protector containing that object. **Step 5: Discussion**

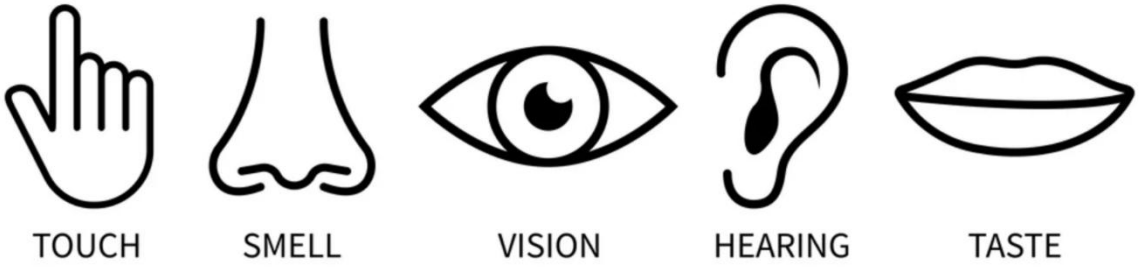
	Finally, the children will bring the boxes with the collected examples back to class, and show and discuss their exploration with the rest of the class. Other children may come up with new ideas about using their senses to explore the objects. For example, if they pick up a leaf, they might say: “I can see it with my eyes; it's green. I can touch it with my hands and I feel its smooth surface on my skin. I can smell it with my nose; it has a fresh odour. I can hear it rustle with my ears when I squeeze it in my hand.”
Source	**Introductory video about the Nervous System:** “Nervous System Facts” by LearningMole **Inspiration video creating the kit:** Outdoor Sensory “Activity for Kids” by Lakeshore Learning
Conclusion (5 min)	The teacher should highlight the work of the nervous system. For example: "When you touch something, like a leaf, the nerves in your skin send a message to your brain, telling you whether it feels soft or rough."

	"When you smell a flower, the nerves in your nose detect the scent and send that information to your brain, helping you recognise the smell." "Your eyes work with your brain to process what you see. For example, when you look at a tree, your brain helps you understand its colour and shape." "Hearing a sound involves your ears picking up vibrations, which your brain translates into something you can recognise, like music or someone's voice."
Explain the experiment (5 min)	As you can see, our five senses are crucial to exploring our surroundings and identifying objects. Our eyes help us see colours, shapes, and movements; our ears let us hear sounds and detect directions; our nose allows us to smell different scents; our tongue helps us taste flavours; and our skin helps us feel textures and temperatures. By combining these senses, we can better understand and interact with the world. However, when we use only one sense, it may be difficult to correctly identify an object. For example, touching an object without seeing it might give clues about its texture but not its colour. Similarly, hearing a sound might help us recognise an animal or an

	instrument, but not its exact shape or size. Our observations become more precise when we use multiple senses together, allowing us to confirm details and avoid mistakes. All senses are extremely useful but the usefulness of each depends also on the type of object we are exploring and the conditions. For example, sight is often the most relied-upon sense because it provides the most information at once. But in situations where sight is limited (e.g., in the dark), touch and hearing become more important.
The science behind	The nervous system is like the body's communication network. It helps us sense, understand, and respond to the world around us. **The brain** – Acts like a control centre, processing information and making decisions. **The nerves** – Work like electrical wires, carrying messages between the brain and different parts of the body. **The five senses** – Our eyes, ears, nose, tongue, and skin send signals through the nerves to the brain,

	helping us recognise sights, sounds, smells, tastes, and textures. Our experiences in life are shaped by our five senses: sight, hearing, smell, taste, and touch. The eyes detect light and send visual information to the brain through the optic nerves. The ears pick up sound waves and convert them into electrical signals, which are sent to the brain via the auditory nerves. The nose detects airborne chemicals, which are translated into smell signals and transmitted to the brain through the olfactory nerves. The tongue contains taste buds that identify different flavours, sending taste signals to the brain. The skin has various receptors that sense pressure, temperature, and pain, conveying touch information to the brain. All these sensory organs work together to send signals to the brain, where the information is processed and interpreted, allowing us to understand and interact with the world around us.

Checklist to be printed for each child:



The object of exploration: ……

☐ Sight (Vision): what I see

☐ Hearing (Audition): what I hear

☐ Smell (Olfaction): what odours I smell

☐ Taste (Gustation): can I taste it? How does it taste?

☐ Touch (Tactile): What do I feel on my skin? Pressure, temperature, structure…

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