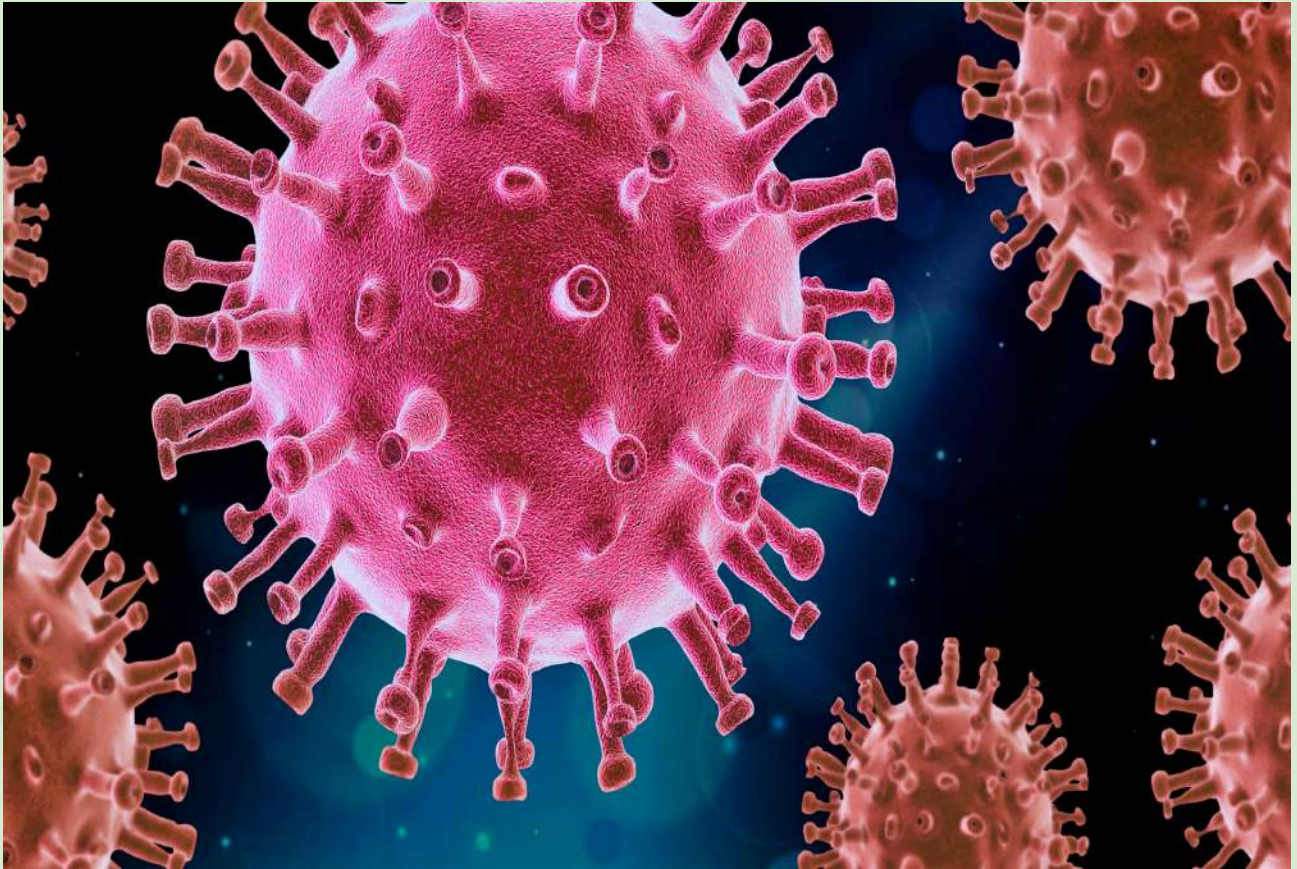




# Learning Activity Plan: Infectious Agents

“Microbial Biodiversity in Water”



	<p><u><a href="#">A video of microorganisms in pond water observed on foldscopes.</a></u></p>
<p>Microorganisms captured on a foldscope.</p>	

<b>Introduction</b>	<p><b>Infectious agents</b> or germs are organisms that are capable of causing a wide variety of infectious diseases affecting various parts of the body. They include bacteria, fungi, parasites, protozoa, and viruses. They can enter the body through the mouth or nose or even through bites and wounds. They can also be transmitted through direct contact, ingestion, via the air, or via a vector, like a tick or mosquito.</p> <p>Drinking contaminated water is one of the many possible sources of infectious agents entering the body. The microbial biodiversity in water can be defined as the range of different kinds of microorganisms in water.</p>
<b>Activity Description</b>	<p>In this activity, learners will observe and discuss infectious agents in water using Foldscopes. They will also discuss the microbial biodiversity that exists in water and their relationship with the ecosystem.</p>
<b>Age group</b>	8 -18 years
<b>Prior Knowledge</b>	<p><u><a href="#">How to use Foldcsope</a></u> Common waterborne diseases within their communities e.g. Bilharzia, Typhoid, Cholera, etc.</p>

<b>Time required</b>	2 hours
<b>Activity Learning Outcome</b>	<p>By the end of this activity, learners should be able to:</p> <ul style="list-style-type: none"> <li>● Identify common water borne diseases in their community and their causing agents.</li> <li>● Come up with possible solutions towards addressing the common water-borne diseases in their community.</li> <li>● Develop an awareness of and sensitivity towards water conservation and its relation to the natural environment.</li> </ul>
<b>Skill Developed</b>	<ul style="list-style-type: none"> <li>- Observation</li> <li>- Critical Thinking</li> <li>- Environmental Conservation</li> </ul>
<b>Resources required</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Water drawn from three different sources e.g. lake, pond, river, tap, etc</li> <li><input type="checkbox"/> Assembled Foldscope</li> <li><input type="checkbox"/> Foldscope pack (with a pipette, disposable gloves, transparent water storage back,....)</li> <li><input type="checkbox"/> Student Observation Book</li> <li><input type="checkbox"/> Pencil &amp; Eraser</li> <li><input type="checkbox"/> Group datasheet</li> <li><input type="checkbox"/> Microbes Identification sheet</li> </ul>
<b>Guiding questions</b>	<ul style="list-style-type: none"> <li>● What microorganisms are present in water?</li> <li>● What happens when you drink contaminated water?</li> <li>● What do you think causes sicknesses in our body?</li> <li>● What can you do to ensure the safety of our drinking water?</li> <li>● What different microorganisms in drinking water cause illness? Possible answers: Viruses, bacteria, fungi.</li> </ul>
<b>Procedure (Step by step guide)</b>	<p>Define microorganisms: Microorganisms (for example, bacteria, viruses, fungi) are tiny, unseen living cells that can be good for us and can also cause harm to our bodies.</p> <p>Activities of the Session</p> <ul style="list-style-type: none"> <li>● Provide the students with a brief overview of how Foldscopes work.</li> <li>● Group the students based on how many Foldscopes are available and give each group a Foldscope.</li> <li>● Each group should create a space on their datasheet to make a drawing for each water source that is available.</li> </ul>

	<ul style="list-style-type: none"> <li>● Allow the learners to go out and collect water samples from the different sources and bring them to the laboratory/classroom.</li> <li>● Direct/Assist the students to prepare the water samples and mount them on Foldscope for viewing.</li> <li>● Let all students in each group observe and make a drawing of the microorganisms with correct labels in the observation book.</li> <li>● Make available an identification book (This could be from the class books or downloaded images) for the students to look for the organisms that they are observing.</li> <li>● When all groups have had a drawing of what they observed, let them exchange the Foldscope, observe and draw specimens of another group.</li> <li>● After each group has made it to all foldscopes, the teacher should assist in placing new slides from different water sources under the lens of each foldscope.</li> <li>● This can continue until each group has had a chance to observe and draw pictures from all of the water sources.</li> <li>● As a class/club, use the reference materials available to identify the different organisms that were found in the different water sources.</li> </ul>
<p>Student Discussion/Extension</p>	<p>What did you observe under the Foldscope? (The student/group should be given time to tell others what they observed.)</p> <p>We looked at different microorganisms drawn from different water sources (fungi, bacteria, etc) that are infectious agents, but are all microorganisms bad? We can add more agents, e.g. in food.</p> <p><b>Extension</b></p> <p>Ask the learners to classify these microorganisms as good or bad.</p> <ul style="list-style-type: none"> <li>● Bacteria that help make cheese out of milk.</li> <li>● Fungus that help make penicillin - medicines that cure common illnesses.</li> <li>● COVID-19 virus that causes sickness and death in some people</li> <li>● Fungus (yeast) that helps us make bread</li> <li>● Bacteria in water causes people to get diseases like cholera</li> </ul>

	<ul style="list-style-type: none"> <li>● Bacteria in our gut that helps us digest food</li> </ul> <p>An extension of this activity could be the observation of “good” microorganisms.</p> <p><b>Student Reflection</b></p> <table border="1"> <tr> <th>What I knew about infectious agents?</th> <th>What have I learnt about infectious agents?</th> <th>What would I like to explore more about infectious agents?</th> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>	What I knew about infectious agents?	What have I learnt about infectious agents?	What would I like to explore more about infectious agents?			
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<p><b>References</b></p>	<ol style="list-style-type: none"> <li>1. <a href="https://www.youtube.com/watch?v=z4qLuXhI3pl">https://www.youtube.com/watch?v=z4qLuXhI3pl</a></li> <li>2. <a href="https://www.nationalgeographic.org/topics/resource-library-infectious-agents/?q=&amp;page=1&amp;per_page=25">https://www.nationalgeographic.org/topics/resource-library-infectious-agents/?q=&amp;page=1&amp;per_page=25</a></li> <li>3. <a href="https://www.nationalgeographic.org/media/infectious-agents/">https://www.nationalgeographic.org/media/infectious-agents/</a></li> <li>4. <a href="https://www.hopewelltpw.org/DocumentCenter/View/113/Facts---Microorganisms-in-Drinking-Water-PDF">https://www.hopewelltpw.org/DocumentCenter/View/113/Facts---Microorganisms-in-Drinking-Water-PDF</a></li> <li>5. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2996186/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2996186/</a></li> <li>6. <a href="https://science.jrank.org/pages/7311/Water-Microbiology.html">https://science.jrank.org/pages/7311/Water-Microbiology.html</a></li> <li>7. <a href="https://www.instagram.com/p/CbIVvenF98D/">https://www.instagram.com/p/CbIVvenF98D/</a></li> </ol>						