Azim Premji University

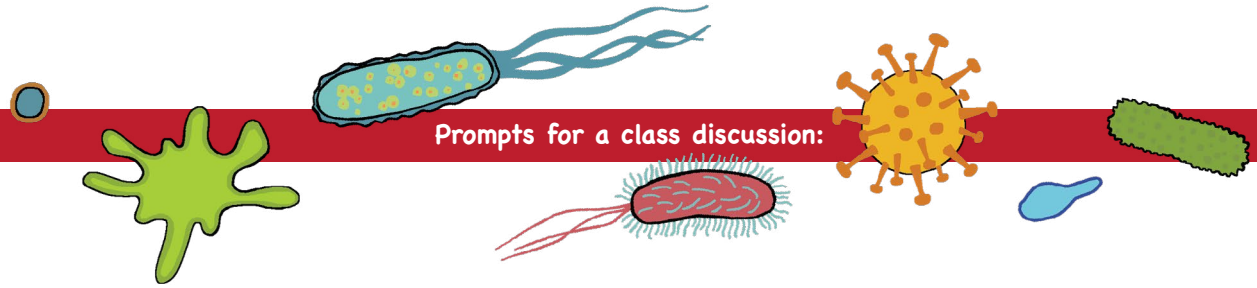
TEACHER'S GUIDE II: GBS & CONTAMINATED WATER

In the article 'Understanding GBS Outbreaks', the scientist Satyajit Rath tells us how an outbreak of GBS could be connected to a contaminated water supply. Contamination of natural sources of water and access to clean water are important themes that run through the preparatory-stage Environmental Studies (EVS) and middle-stage science curricula. Students at both these stages are encouraged to think about where they get water from and whether the water in their homes and school is fit for drinking. Teachers could use GBS to have grade-appropriate discussions on the relevance of these concepts in the real world.

Textbook connections:

- Chapter 18 ('Too Much Water, Too Little Water') of the Grade IV EVS textbook (NCERT, 2024-25) introduces students to differences in access to clean drinking water: *"Deepak had gone with his mother to Raziya Madam's house. His mother worked there... Raziya called out, "Pushpa, it says in the newspaper that the gutter water has got mixed with the water in the drinking water pipes, in this area. It says that many people are sick with diarrhoea and vomiting because of this. Why don't you throw away the water that was filled yesterday? Put some fresh water to boil, for drinking. Also take home some boiled water for your family" Deepak was happy to hear this. He thought, "At least today I will not have to stand in a queue for hours to get water for our house. It is a real holiday for me!""*.[1]
- Chapter 13 ('A River's Tale') of the Grade IV EVS textbook (NCERT, 2024-2025) lists some of the ways in which human activities can dirty sources of drinking water (like rivers, lakes, and ponds): "*... as the river flowed through or near many villages, towns and cities the water changed. The people used the river water for many different things such as washing clothes, bathing animals and cleaning utensils. Many of these activities made the water dirty. The water in the river kept changing as it flowed through various places. Water in ponds and lakes can also become dirty due to similar reasons.*" Later in the chapter, students learn that: "*...it is important that we clean water before drinking it. One of the best ways to do this is to boil the water*".[2]
- In Chapter 13 ('Wastewater Story') of the Grade VII science textbook (NCERT, 2024-2025) students learn that: "*Clean water is a basic need of human being... It has been reported that more than one billion people have no access to safe drinking water... Poor sanitation and contaminated drinking water is the cause of a large number of diseases... Groundwater is a source of water for wells, tubewells, springs and many rivers. Thus, it becomes the most common route for water borne diseases. They include cholera, typhoid, polio, meningitis, hepatitis, and dysentery*".[3]
- In Chapter 2 ('Microorganisms: Friend and Foe') of the Grade VIII science textbook (NCERT, 2024-2025), children learn that: *"Pathogens enter our body through the air we breathe, the water we drink, or the food we eat. They can also get transmitted by direct contact with an infected person or carried by an animal. Microbial diseases that can spread from an infected person to a healthy*

person through air, water, food, or physical contact are called communicable diseases".[4]



Prompts for a class discussion:

1. **Local sources of water:** Invite students to list major sources of water in their locality. Work with them to classify these into surface water and ground water sources.

2. **Causes of water contamination:** Ask students if it would be safe to drink water directly from any of the local sources they have listed. Can they think of some ways in which these water sources get contaminated or unfit for drinking? Encourage students to share observations from their everyday lives that support their responses. For example, have they seen how humans and animals use these water sources? Is there a landfill nearby that can contaminate land and water? Have they read (in newspapers), heard about (on radio or television or through conversations between friends, family members, or teachers), or seen sewage from homes mixing with clean water? Is there a factory or mill nearby that dumps harmful material in water bodies?

3. **Sources of drinking water at school and home:** Ask students if they use the same water for washing and drinking. Where does the drinking water in school and in their homes come from? Do they get water from wells or taps in their homes? Do they get it from water tankers? Or do they fetch water from a pond, river, or a community well? What challenges do they, their families, and people from their neighbourhood face in getting drinking water?

4. **Quality of drinking water:** Are there ways to tell if the drinking water in school and their homes is contaminated? Do they know some ways to test this? If possible, you could arrange for them to visit and talk to local government officials (like the Panchayat President or Sarpanch) to find out more about how, when, and how often water is tested in their locality. You could also show them the **Jal Jeevan Mission** website (see **Fig. 1**). They could use this government website to view and download test reports for some of the water sources in their locality. One of these tests is for the presence of bacteria. Highlight these 'bacteriological' test results and discuss what this tells them about the water quality from these sources.

5. **Connection with disease:** With this context, introduce the fact that reports from Pune suggest that the microorganism most likely to be involved in the rise of GBS cases is a bacterium most commonly found in animal (including poultry) faeces.

- Share that the infections that trigger GBS could be caused by eating undercooked meat or dairy products. Invite one group of students to think of how the bacterium makes its way to such food products. You could encourage students to present this in the form of a diagram.

- Share that the infections that trigger GBS could be also be caused by drinking contaminated water. Invite a second group of students to think of how the bacterium makes its way to drinking water sources. Encourage this group to also present this in the form of a diagram.

- Invite both groups to display and explain their diagrams to the rest of the class. Draw their attention to the number of GBS cases being reported from the same geographic area. Ask students to use this fact to discuss which of these two sources of contamination (food or water) seem more likely to be linked to these cases? What kind of evidence would they need to support their response? Discuss the kind of evidence that scientists have used to arrive at the most likely

cause of the outbreak. Ask students to share how similar or different this is from their own approach.

6. **Preventive measures**: Ask students to observe how drinking water is treated and stored in their homes and school. What steps are taken to make it safer to drink? Is it boiled? Is it filtered? Can they think of other simple measures their classmates and other children in school can take to reduce their chances of falling sick from drinking contaminated water?

At the end of this exercise, you could invite students to present what they have learnt in the school assembly. Emphasize the need to focus on simple preventive measures that can help protect us from disease. They could create a poster, song, or skit for the presentation (preferably in the language they use to speak to their classmates and other students outside class hours). Encourage them to use their own words rather than what they hear teachers use or read in their textbooks.

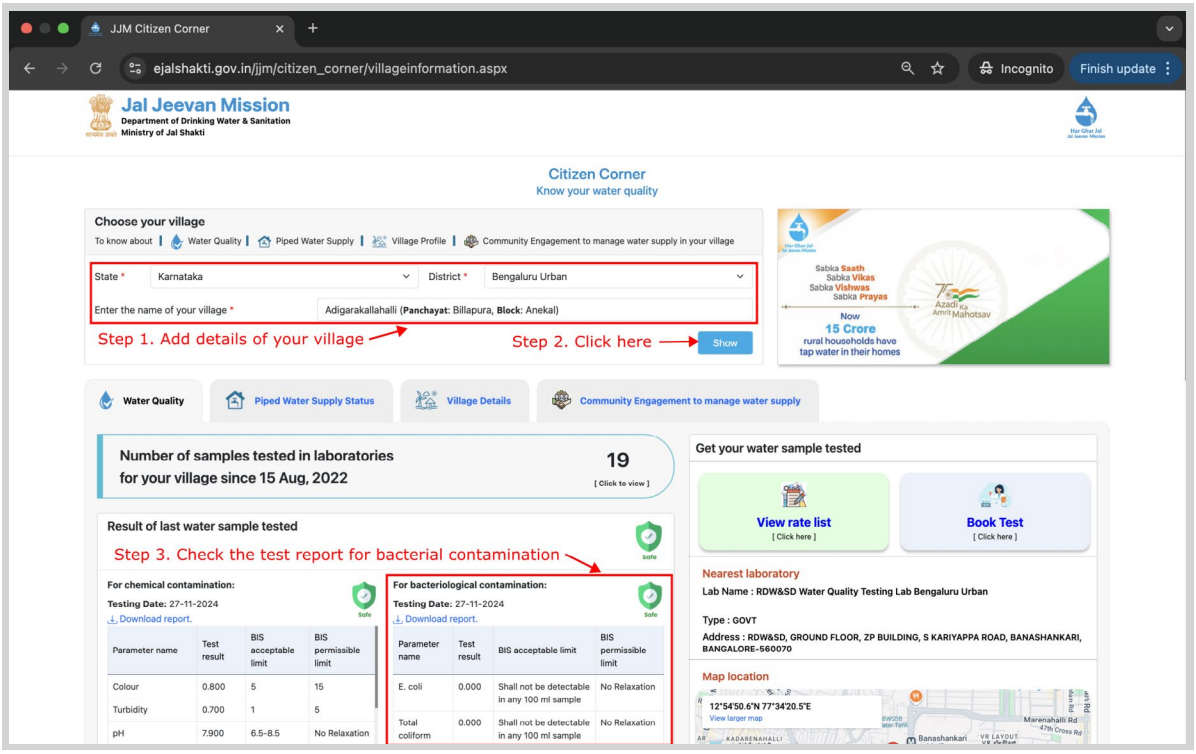


Fig. 1. A screenshot from village-level information on water sources on Jal Jeevan Mission—Citizen Corner. Steps: (1) Fill the spaces given for "State", "District", "Enter the name of your village". (2) Click "Show". (3) Highlight the test results "For bacteriological contamination". URL: https://ejalshakti.gov.in/jjm/citizen_corner/villageinformation.aspx.

Curricular connections:

Discussions around this theme can help meet the following curricular goals listed in National Curriculum Framework for School Education (NCF-SE) 2023 for:

(A) Preparatory-stage EVS:

- CG-1: [The student] explores and engages with the natural and socio-cultural environment in their surroundings. Specifically, it can help them develop the following competency: C-1.1: *"Observe and identify the natural (...natural resources) and social... components in their immediate environment."*
- CG-2: [The student] understands the interdependence in their environment through observation and experiences, developing the basis for appreciation of the idea of '*Vasudhaiva Kutumbakam*'.

Specifically, it can help students develop the following competency: C-2.1: *"Identify natural and human made systems that support their lives (water supply, water cycle, river flow systems… food…)."*

- CG-3: [The student] explains how to ensure the safety of self and others in different (normal as well as emergency) situations. Specifically, it can help students develop the following competencies: (a) C-3.1: *"Describe the basic safety needs and protection (health and hygiene, food, water… precautions, awareness of emergency situations…) of humans, birds, and animals"* and (b) C-3.3: *"Develop simple labels and slogans, and participate in role play on safety and protection in the local environment to be displayed/done in school and locality."*
- CG-4: (The student) develops sensitivity towards social and natural environment. Specifically, it can help students develop the following competencies: (a) C-4.3: *"Describe usage of natural resources in their immediate environment"*, (b) C-4.4: *"Demonstrate how natural resources can be shared, maintained, and conserved"*, and (c) C-4.7: *"Learn about basic social and behavioural norms, values, and dispositions that benefit our social and natural environments and that help our society function smoothly (conserving water… keeping one's environment clean…)."*

(B) Middle-stage science:

- CG-5: [The student] understands the interface of Science, Technology, and Society. Specifically, it can help students develop the following competencies: (a) C-5.1: *"Illustrate how Science and Technology can help to improve the quality of human life (health care…) as well as some of the harmful uses of science in history"*, and (b) C-5.2: *"Share views on news and articles related to the impact that Science/Technology and society have on each other."*
- CG-7: [The student] communicates questions, observations, and conclusions related to science. Specifically, it can help students develop the following competency: C-7.1: *"Use scientific vocabulary to communicate science accurately in oral and written form, and through visual representation."*[5]

Supporting resources:

In discussions around GBS, especially around preventive measures, your students may have many questions about microbes and how they make their way into our body. Two pictorial resources, published in the Oct 2020 issue of i wonder... may be of help:

(a) An 8-page booklet titled 'Common myths about microbes' written by Somdatta Karak.

(b) A poster titled 'The Chain of Infection' written by Vijeta Raghuram.

References:

1. National Council of Educational Research and Training (2024). 'Chapter 18: Too Much Water Too Little Water'. EVS Textbook for Grade IV: 146-157. URL: https://ncert.nic.in/textbook.php?deap1=18-27.
2. National Council of Educational Research and Training (2024). 'Chapter 13: A River's Tale'. EVS Textbook for Grade IV: 106-112. URL: https://ncert.nic.in/textbook.php?deap1=13-27.
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4. National Council of Educational Research and Training (2024). 'Chapter 2: Microorganisms: Friend and Foe'. Science Textbook for Grade VIII: 17-31. URL: https://ncert.nic.in/textbook.php?hesc1=2-13.
5. National Steering Committee for National Curriculum Frameworks (2023). 'National Curriculum Framework for School Education 2023'. National Council of Educational Research and Training.URL: https://ncert.nic.in/pdf/NCFSE-2023-August_2023.pdf.

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