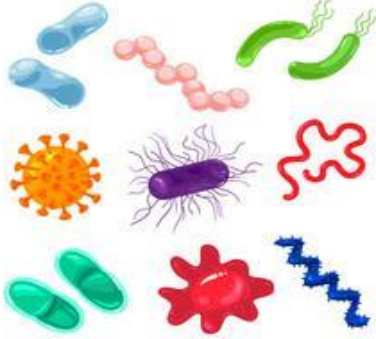


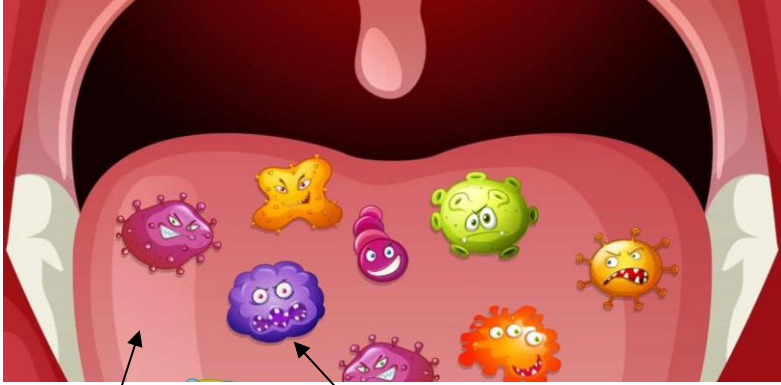
UNDERSTANDING VACCINES AND INFECTIONS

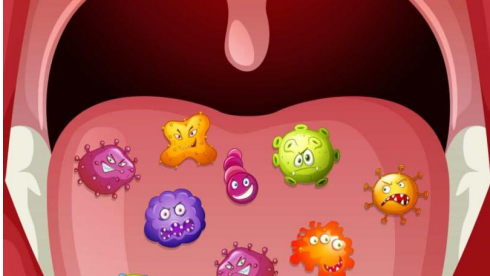

Ages 4 to 7 (Level 1)

Description:	Learners will understand what an infection is and how vaccines play a role in reducing infection rate.
Leading question:	Can you help your community understand the importance of vaccines?
Age group:	4 – 7 years
Subjects:	Science, Literacy and Numeracy
Total time required:	5 hours over 5 days
Self-guided / Supervised activity:	High Supervision
Resources required:	Paper, Pencil, Eraser

Day	Time	Activity and Description
1	10 minutes	<p>Discussion: Have a conversation with the learners to understand how they think disease is caused. Here are a few questions that you can ask:</p> <ul style="list-style-type: none"> • Can you name examples of living organisms and non-living organisms? What makes something living vs non-living? (Answer: living organisms eat, breathe, grow, move, and respond/adapt to their environment) • In times when you have been sick, what happened and what do you think caused it? (Hint: think about what you were doing, where you were, how the weather was etc.)
	25 minutes	<p>Introduce learners to disease causing microorganisms in this way:</p> <ul style="list-style-type: none"> • Diseases are caused by small living things that enter our body – they are so small that we cannot see them with our eyes! Can you draw an image of what you think they look like? • Based on the discussion you just had, ask the learner to list places where they think these disease-causing living things can be found. For example, in water, in other living things, in food that we eat, on dirty surfaces like remotes and door handles etc. • Also ask the learner to list <i>from where</i> they think these small living things can enter our body. For example, through our nose, our mouth, through a small or large cut in the skin, through our eyes etc. <p>There are two types of small living things that cause disease:</p> <ol style="list-style-type: none"> 1. Bacteria - there are bacteria that help us digest food better (good bacteria) and those that make us sick (bad bacteria)

	<p>20 minutes</p>	<p>2. Viruses (there are only bad viruses)</p> <p>These small living things come in many shapes and each one causes a different disease:</p>  <ul style="list-style-type: none"> ● Ask the learner to describe, in their own words, some features of these living things. What do you see in the picture? What similarities and differences do you see compared to how you imagined it? ● Ask the learner: based on what you see, can you think of why we get sick when these enter our body? (Answer: our body is able to recognize when a bad bacteria or virus enters and tries to fight it. During this fight, we feel sick, get fever and feel tired. We feel better once our body has fought it off). ● COVID-19 is a virus. When this virus enters our body we get sick. Some ways that we think it spreads is through: <ul style="list-style-type: none"> ○ Water droplets – if you are infected, sneezing and coughing close to others can make others sick too. ○ Contacting contaminated surfaces <p>Create a visual depiction of how bacteria and viruses can enter our body.</p> <p>On the last day of this project the learner will present what they know about infections and vaccines. This activity is in preparation for the final presentation.</p> <ul style="list-style-type: none"> ● Based on what the learner learnt today, ask them to illustrate and label a diagram showing how a bacteria or virus can enter our body. Here is an example of bacteria entering through the mouth:
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<p>5 minutes</p>	 <p>An open mouth</p> <p>Bacteria entering through the mouth</p> <ul style="list-style-type: none"> • Other options include someone sneezing whilst sitting next to another person and spreading disease. • Someone touching a dirty item <p>Conduct a show and tell:</p> <ul style="list-style-type: none"> • In pairs, show your drawings to each other and explain what your diagram shows. <p>Learners can be given the opportunity to ask each other questions about their drawing.</p>
<p>2</p> <p>10 minutes</p> <p>10 minutes</p>	<p>Learners will learn how we can prevent infection.</p> <p>Discussion: Have a conversation with the learners to understand how much they know about good hygiene practices and ways to remain disease-free. Here are some questions you can ask:</p> <ol style="list-style-type: none"> 1. What are some ways we can avoid being sick? (Some answers might include eating healthy, washing hands, staying active etc.) 2. During the COVID-19 pandemic we all have to wear masks, why do you think we do this? (Answer: to avoid spreading COVID-19 virus through sneezes and coughs.) <p>Why do disease prevention mechanisms work?</p> <p>For each of the prevention mechanisms listed below, ask the learners why they think it prevents disease:</p> <ol style="list-style-type: none"> 1. Cooking food that has bacteria at high temperatures 2. Washing dirty hands with soap and water 3. Covering our nose and mouth when sneezing or coughing 4. Cleaning open wounds

	<p>30 minutes</p>	<p>5. Covering open wounds with a Band-Aid</p> <p>(Answers):</p> <ol style="list-style-type: none"> 1. Bacteria on meat and vegetables die at high temperatures. 2. Using soap kills bacteria. 3. It stops the spread of any bacteria that is in the water droplets of your cough and/or sneeze. 4. Bacteria or viruses can enter through open wounds so disinfecting the area kills any microorganisms. 5. Bacteria or viruses can enter through open wounds, so keeping the cut covered can reduce chances of microorganisms entering. <p>Conduct a simple demonstration to show how bacteria is killed off through hand washing:</p> <ol style="list-style-type: none"> 1. Sprinkle black pepper on the learners' hand to represent bacteria 2. Hold it under running water and use soap to clean off the "bacteria" <p>How our body fights disease:</p> <ul style="list-style-type: none"> ● Stage 1: Once a bacteria or virus enters our body, (refer to the image you drew yesterday),  <ul style="list-style-type: none"> ● Stage 2: Our body tries to fight the bacteria or virus off. Draw the scene of our body fighting an infection in the way that you think it happens using small fighters. An example is shown below: 
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	10 minutes	<ul style="list-style-type: none"> ● During the fight our body gets sick. Ask the learner to name these “fighters”. Some names they might come up with could include, soldiers, policemen, good guys etc. Role play the fight between the body and the bad bacteria. ● Stage 3: Once the fighters have defeated the bacteria or virus, we feel better. Draw the scene of the bad bacteria defeated and the fighters having won. <p>Main takeaway: Ensure the learner is aware of how our body is feeling at each of the 3 stages.</p> <p>Think about it:</p> <ul style="list-style-type: none"> ● We feel sick once the bacteria has entered our body and when our body is fighting the bacteria. How long is this time period usually? Think about the last time you were sick – how long did you feel tired and weak? (Answer: ~5 days) ● How do you think we can shorten the time we are sick? (Answer: Help the fighters by taking your medicines, resting and eating healthy food.)
3	15 minutes	<p>Today learners will learn about the normal infection pattern or cycle.</p> <p>Conduct an introduction to vaccines:</p> <ul style="list-style-type: none"> ● Discussion questions: Have you heard of the word ‘vaccine’? What do you think a vaccine is and what do you think a vaccine does? (<i>Optional question: Have you been vaccinated before? If so, what disease was it against and how did you feel after it?</i>) <p><i>*Please note that medical information is private unless consent is provided to share.</i></p> <ul style="list-style-type: none"> ● A vaccine is injected to help us fight an infection caused by a bacteria or virus! ● The vaccine contains <i>a little bit</i> of the disease-causing bacteria or virus which tricks our body into thinking there is an invasion. But these bacteria and viruses in vaccines are not alive and cannot hurt us. ● If our body thinks it’s getting invaded, what do you think it makes? (Answer: fighters) ● But there is no infection so the fighters wait until there is a real infection and they fight off the bacteria or virus faster than usual. Since there is nothing to fight, we don’t feel too sick after a vaccine.

<p>20 minutes</p>	<p>Ask learners to create a labelled drawing showing how a vaccine helps create fighters in our body.</p>
<p>10 minutes</p>	<div data-bbox="479 325 1291 808" data-label="Image"> </div> <p>Conduct a discussion session:</p> <ul style="list-style-type: none"> • What do you think are the benefits of getting vaccinated? (Possible answers: <ol style="list-style-type: none"> 1. It helps prepare our body for real bacteria and viruses 2. A real infection will not last as long or will not be felt at all because fighters are already ready. 3. You reduce the chances of making others around you sick.) • Do you think one vaccine will create fighters for all diseases? Or do we need to take a different vaccine to create fighters for each disease? <p>(Answer: Each bacteria that causes a specific disease is different so the fighters are different. Refer to images from Day 1 where bacteria and viruses are shown in different shapes and colours. Each bacteria and virus is different and affects our body in a different way. This means each disease needs its own vaccine.)</p>
<p>4</p>	<p>Learners will create an informative poster about infections and vaccines.</p> <ul style="list-style-type: none"> • Gather all the illustrations you created in the past 3 days. These include the following: <ul style="list-style-type: none"> ○ How viruses enter our body ○ How our body fights disease ○ Bad bacteria defeated by fighters Vaccine helping to create fighters. • Decide on the title of your poster and your main message. Some examples include:

	50 minutes	<ol style="list-style-type: none"> 1. The cycle of infection – why do we get sick? 2. Vaccines can help us fight bad bacteria and viruses! <p>Ask the learner to create their own poster by gluing in or taping in all the illustrations they made. Make sure that they focus on the main message and offer help to spell words they don't know.</p>
5	<p>15 minutes</p> <p>3-5 minutes per learner</p> <p>1 minute per learner</p>	<p>Today you will present your posters to your family and/or friends!</p> <p>Prepare for the presentations by pasting all the learners' posters on the board or the wall.</p> <ul style="list-style-type: none"> • Each learner presents their posters to their family (if present) and/or the other learners. They should focus on their main message and explain their drawings with logical chronological flow. • Criteria for presentation assessment: <ul style="list-style-type: none"> ○ Vocal projection: Can everyone in the room hear the presented clearly? ○ Content: Is the order of information logical? ○ Confidence and tone: Does the presenter understand the content presented? Were the questions answered correctly? ○ Presenting 3 stages of infection in a logical/sequenced manner ○ Clear presentation of how vaccines work and their benefits • After each learner presents, the facilitator, family member or fellow learner asks the presenter 1 question about their poster or about their experience learning about infection. Some questions you may ask include: <ol style="list-style-type: none"> 1. What did you find most interesting about this project? 2. How will you try to prevent you and your family from getting sick? 3. What do you think about vaccines? Are they good or bad, and why? <p>Can you clarify (a specific part) of your poster to us? What is happening in (this part) of your drawing?</p>
Assessment Criteria:		<p>Students' participation in discussion questions throughout the 5 days.</p> <ul style="list-style-type: none"> - Assess the level of engagement, thoughtfulness and linking of new concepts learnt to experiences they have had with disease. - Day 2 disease prevention discussion answers: Demonstration of critical thinking and application of new concepts when describing why they think disease prevention mechanisms work. - The learner asks questions from the facilitator and other learners' during their presentation.

	<p>Observation skills</p> <ul style="list-style-type: none"> - Assess the extent to which the learners’ illustrations contain detail. Have the concepts learned during the lesson been translated to their drawings? - Assess their answers to observation-based discussion questions. Do their answers contain detail? Are accurate similarities and differences being identified? <p>Poster</p> <ul style="list-style-type: none"> - Assess whether the poster has a main message and focus that is consistent. A clear main message is seen and the poster is appropriately titled. - Accuracy – the poster is scientifically accurate to the degree that the learners have been taught. <p>Presentation</p> <ul style="list-style-type: none"> - Communication – demonstrate confidence in the material presented including when answering questions.
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Learning outcomes:	<ul style="list-style-type: none"> ● Identify at least one microorganism that can cause disease. ● Understand why certain common practices help prevent disease. ● Understand that a vaccine prevents disease and know what a vaccine contains. ● Know that our bodies produce fighters against disease when we get sick. ● Learn how to communicate scientific information and ask scientific questions. ● Learn to think critically
Required previous learning:	None
Inspiration:	EAA
Additional enrichment activities:	<p>Students can prepare the following (literacy extension):</p> <ul style="list-style-type: none"> - Imagine that you are a news presenter - Report on the latest COVID-19 vaccine released and how it is able to save many lives
Modifications to simplify the project tasks if need be	If the learner is unable to create a drawing of how vaccines help us fight disease based on the information provided, show an example for them to replicate and walk them through the different stages.

Ages 8 to 10 (Level 2)

Description:	Learners will understand what an infection is and how vaccines play a role in reducing infection rate.
Leading question:	How can you help your community understand the importance of vaccines?
Age group:	8-10 years
Subjects:	Science, Literacy and Numeracy
Total time required:	5 hours over 5 days
Self-guided / Supervised activity:	High Supervision
Resources required:	Paper, Pencil, Eraser

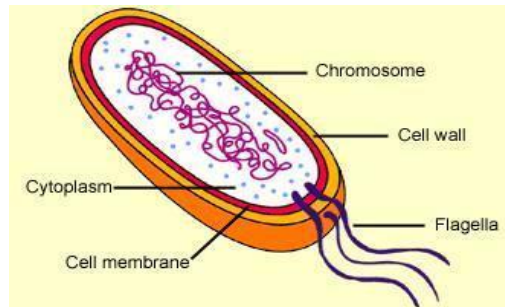
Day	Time	Activity and Description
1	10 minutes	<p>Today learners will be introduced to the organisms that make us sick.</p> <p>Discussion: Have a conversation with the learners to understand how they think disease is caused. Here are a few questions that you can ask:</p> <ul style="list-style-type: none"> ● In times when you have been sick, how did you feel? What do you think caused it? ● What activities, do you think, are more likely to make you sick? (For example, swimming in lakes that are unclean, eating raw or undercooked food, being around a sick person etc.) ● Do you have any questions about disease based on some experiences you have had? <p>What are the different things you feel and experience when you get sick? (For example, you feel tired, then you have fever for 2 days, the fever then subsides and you take 2 days to recover and finally you feel back to normal after 5-7 days.</p>
	25 minutes	<p>Introduction to disease causing microorganisms:</p> <ul style="list-style-type: none"> ● Diseases are caused by small living things that enter our body – they are so small that we cannot see them with our eyes! ● Based on the discussion you just had, ask the learner to list places where they think these diseases-causing living things can be found. For example, in water, in other living things, in food that we eat, on dirty surfaces like remotes and door handles etc. ● Also ask the learner to list <i>from where</i> they think these small living things can enter our body. For example, through our nose, our mouth, through a small or large cut in the skin, through our eyes etc.

There are two types of microorganisms (*micro* meaning small and *organism* meaning an individual life form) that cause disease:

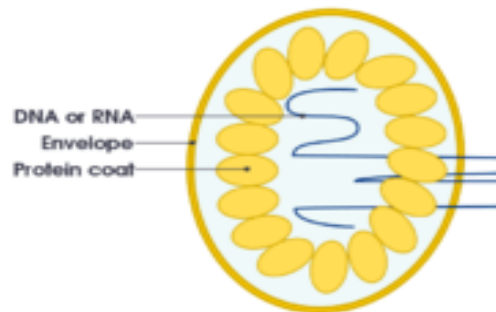
1. Bacteria (there are good and bad bacteria) – these can live in most conditions including the extremely cold and the extremely hot
2. Viruses (there are only bad viruses) – these are parasites which means they live within other living life forms in order to survive

They come in many shapes and each one causes a different disease, here is what they might look like:

Bacteria:



Virus:



- Ask the learner to describe, in their own words, some features of bacteria and viruses. What do you see and notice? What do you wonder about what you see?
- Why do you think we get sick when these enter our body? (Answer: Our body is able to recognize cells that are its own and cells that are *not* its own. It tries to fight cells that are not its own because they can harm our body. During this fight we feel sick, get fever and feel tired. We feel better once our body has fought it off).

Explain that over the next days we will learn more about the mechanism.

	<p>20 minutes</p>	<ul style="list-style-type: none"> ● COVID-19 is a virus. When this virus enters our body we get sick. Some ways that COVID-19 is thought to spread is through: <ul style="list-style-type: none"> ○ Water droplets – if you are infected, sneezing and coughing close to others can make others sick too. ○ Contacting contaminated surfaces <p>Create a visual depiction of how bacteria and viruses can enter our body.</p> <p>On the last day of this project the learner will create a persuasive brochure to present what they know about infections and vaccines and how vaccines help prevent disease. This activity is in preparation for the final brochure.</p> <ul style="list-style-type: none"> ● Based on what the learner learnt today, ask them to: <ul style="list-style-type: none"> ○ Illustrate and label a diagram showing how and where a bacteria or virus can enter our body. ○ Write a short description of the illustration ○ Here is an example: <div data-bbox="418 867 1317 1207" data-label="Image"> </div> <p>The diagram shows bacteria entering through an open mouth. Bacteria can be found in uncooked food or dirty water. If we eat or drink these, we allow bad bacteria to enter our body and this can make us sick.</p>
	<p>5 minutes</p>	<p>Show and tell:</p> <ul style="list-style-type: none"> ● In pairs, share your image and description with each other. Ask each other one scientific question about your partners' image and description after reading it. <p>A scientific question is an investigative or thought-provoking question, such as:</p> <ul style="list-style-type: none"> ● What is it in uncooked food that makes us sick? <p>You have drawn (<i>insert what fellow learner has drawn here</i>), can you explain why you chose this specific way over an alternative way of representing it?</p>

- Our body tries to fight the bacteria or virus off because the bacteria or virus can harm our body.

What do you think our body does to fight the bad bacteria or virus? An illustration is shown below to get you thinking:

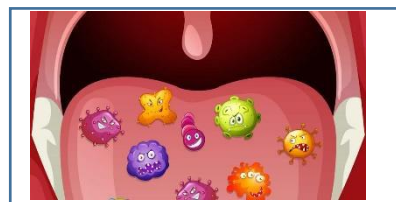


- During the fight our body gets sick.
Ask the learner to name these “fighters”. Some names they might come up with could include, soldiers, policemen, good guys etc. (*ensure they do not use the name ‘good bacteria’ or ‘good virus’*)
- Once the fighters have defeated the bacteria or virus, we feel better.

You already created a diagram of (i) the bad bacteria invading on day 1.

Draw the 2 remaining scenes of (ii) our fighters fighting the bad bacteria and (iii) our fighters winning. For each scene **write a description** that includes how we are feeling during this time.

Main takeaway: Ensure the learner is aware of how our body is feeling at each of the 3 stages.



The image shows bacteria entering through an open mouth. Bacteria can be found in uncooked food or dirty water. At this stage we don't feel sick yet.

If we eat or drink these, we allow bad bacteria to enter our body and this can make us sick.

Illustration of antibodies created and fighting the bad bacteria or virus

Fighters are made in our body, this can take 1-2 days.

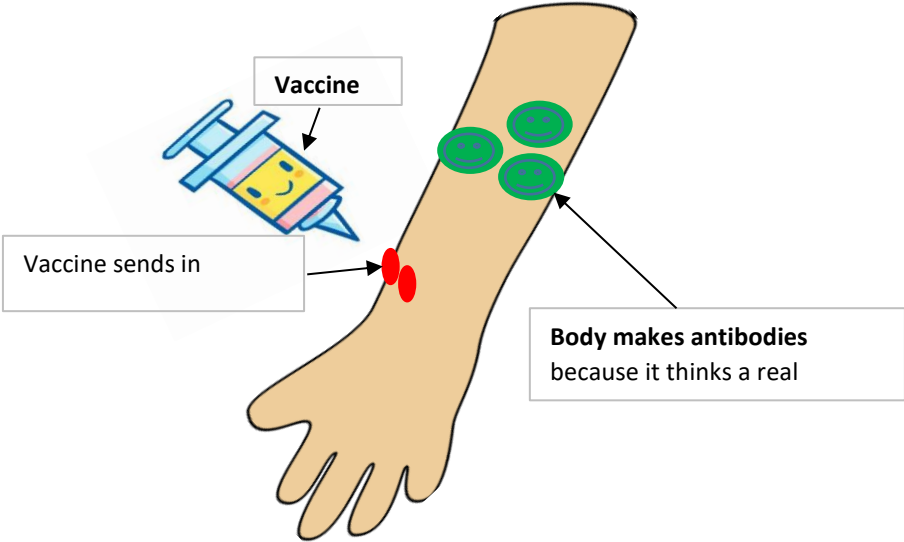
The fighters created fight off the bacteria. This could take between 2-3 days.

Illustration of antibodies defeating the bad bacteria or virus.

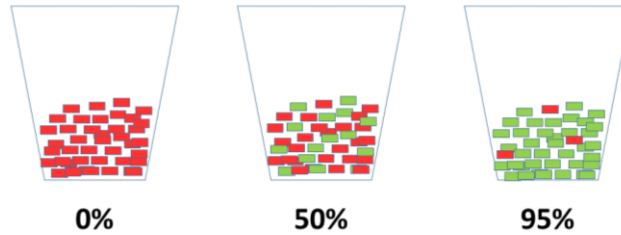
We feel sick for ~5 days during this and we usually take medicines to help reduce fever.

When our fighters win and the bacteria are killed, we feel better again!

<p>10 minutes</p>	<p>Think about it:</p> <p>Once bacteria enter our body, it takes time for our body to recognize them and make fighters – during this time we remain sick. The fighters created are called antibodies.</p> <ul style="list-style-type: none"> • We feel sick once the bacteria has entered our body and when our body is fighting the bacteria. How long is this time period usually? (Answer: ~5 days) • How do you think we can shorten the time we are sick? <p>(Answer: Have antibodies prepared early or recognize the bad bacteria/virus in a shorter time).</p>
<p>3</p> <p>15 minutes</p> <p>15 minutes</p>	<p>The learner will learn about the normal infection pattern or cycle.</p> <p>Based on yesterday’s final discussion, create an illustrated timeline of the events that take place when we get sick. From the time of exposure to when we recover from the disease.</p> <ul style="list-style-type: none"> • An example is shown below: Include reasons why each stage takes place and add as much detail as you can. <div data-bbox="665 966 941 1449" style="text-align: center;"> </div> <p>Conduct an introduction to vaccines:</p> <ul style="list-style-type: none"> • Discussion questions: Have you heard of the word ‘vaccine’? What do you think a vaccine is and what do you think a vaccine does? When do we take it? • A vaccine is injected to help us fight a bacterial or viral infection before we are infected!

	<p>20 minutes</p>	<ul style="list-style-type: none"> • The vaccine contains <i>some part</i> of the bacteria or virus which tricks our body into thinking there is an invasion. The bacteria/virus in vaccines are not alive and cannot harm us but our bodies react to anything that tries to enter it. • If our body thinks it's getting invaded, what do you think it makes? (Answer: creates antibodies) • But there is no infection so the antibodies wait until there is a real infection and they fight off the bacteria or virus faster than usual. <p>Create a labelled diagram showing how a vaccine helps create antibodies in our body.</p> 
	<p>10 minutes</p>	<p>Write a short description of the events taking place in the diagram you drew.</p> <p>Think about it:</p> <ul style="list-style-type: none"> • Do you think it's expected that we feel tired or get a slight fever after a vaccine? Why or why not? (Answer: Yes, it is expected because our body is making antibodies and attempting to kill the invading bacteria in response to the part of the bacteria or virus that has entered). • What do you think are the benefits of getting vaccinated? List them. (Possible answers: <ol style="list-style-type: none"> 1. A real infection will not be as severe because antibodies are already ready. 2. A real infection will not last as long or will not be felt at all because antibodies recognize the bacteria earlier.

		<p>3. You reduce the chances of making others around you sick because you are sick for a shorter time or not sick at all.)</p> <ul style="list-style-type: none"> Do you think one vaccine will create antibodies for all diseases? Or do we need to take a different vaccine to create antibodies for each disease? Discuss this with a partner. (Answer: Each bacteria that causes a specific disease is different so the antibodies needed are different. This means each disease has its own vaccine.)
4	<p>10 minutes</p> <p>40 minutes</p>	<p>Today the learner will learn what herd immunity is.</p> <ul style="list-style-type: none"> Discussion questions: <ul style="list-style-type: none"> Why are vaccines important? What are some reasons that a person might choose to not get vaccinated? (Possible answers: it does not pair well with other medicines they are taking, religious reasons, they are too young or too old, they have a known allergy etc.) What is one way we can help protect them whilst also keeping ourselves safe? (Answer: Have a large number of vaccinated people in the community. This way the vaccinated people are less likely to get sick and therefore less likely to spread disease to someone who is unable to get the vaccine). <p>Numeracy activity to demonstrate herd immunity:</p> <ul style="list-style-type: none"> Students are introduced to the concept of vaccinating a significant portion of the community in order to curb the spread of infection. <ul style="list-style-type: none"> Label 3 opaque buckets or baskets, with the tags "0%, 50% and 95%". For this activity red paper is unvaccinated and green paper is vaccinated. In the 0% bucket, get the students to place 60 torn up small pieces of red paper. In the 50% bucket, they need to place 60 papers in total but half should be red papers and half should be green papers. Get the learners to calculate how many papers of each color they need to place. (Answer: 30 pieces each). In the 95% bucket, the students place 3 red papers and 57 green papers. <p>The illustration below shows an example:</p>



- Students will be acting as the infectious bad bacteria.
- Each student takes a turn dipping their hands, while closing their eyes, into each bucket and taking a handful of papers. They write down the number of papers they have in each color, after collecting papers from each bucket, using the first table below. Learners should return the papers back into the same bucket once the numbers are recorded.

Number of red and green gathered

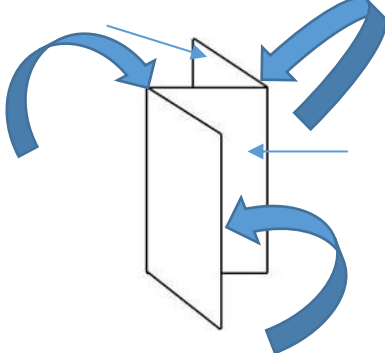
Bucket	Number of red gathered	Number of Green gathered	Total
0%	5	0	5
50%	4	4	8
95%	0	6	6

Once all the learners have completed the first table, each learners fills out their own second table:

Optional: Percentage of red and green gathered

Bucket	Percentage red gathered	Percentage green gathered
0%	$5/5 = 100\%$	$0/5 = 0\%$
50%	$4/8 = 50\%$	
95%		

Since the learners are the “bad bacteria”, the number of red papers (unvaccinated) they picked up reflects how many people they were able to infect.

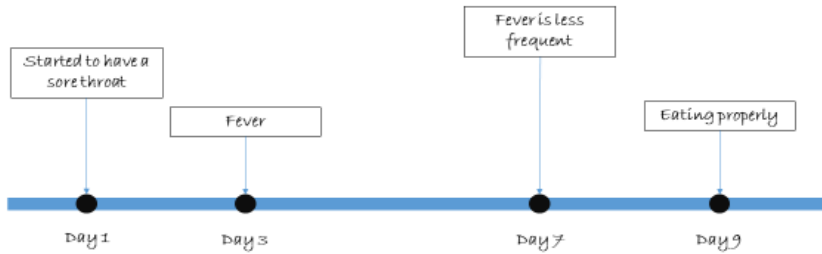
	<ul style="list-style-type: none"> On the remaining 5 pages (marked with arrows), paste in your relevant illustrations from the previous days and write a sequential series of events to <u>explain your main message</u>.  <ul style="list-style-type: none"> For example, if your main message is “vaccines can help us fight infection”, your brochure could contain the following information with illustrations: <ul style="list-style-type: none"> Page 1 – What causes an infection? (Illustration of what a bacteria and virus is including where they are commonly found and how they can enter our body). Page 2 and 3 – How does an infection progress? Page 4 – How can a vaccine reduce the time for which we are sick? Why should you get vaccinated? Page 5 – What are the other advantages of vaccines? Is it common to have vaccine side effects? Share your brochure with at least 1 family member or friend who does not know about infections and vaccines and answer any questions they might have. Convince them that vaccines can help prevent diseases.
<p>Assessment Criteria:</p>	<p>Students’ participation in discussion questions throughout the 5 days.</p> <ul style="list-style-type: none"> Assess the level of engagement, thoughtfulness and linking of new concepts learnt to experiences they have had with disease. Disease prevention discussion answers: Demonstration of critical thinking and application of new concepts when describing why they think disease prevention mechanisms work. The learner asks good thought-provoking questions from the facilitator and other learners’ during discussion sessions <p>Observation skills</p> <ul style="list-style-type: none"> Assess the extent to which the learners’ illustrations contain detail. Have the concepts learned during the lesson been translated to their drawings?

	<ul style="list-style-type: none"> - Assess their answers to observation-based discussion questions. Do their answers contain detail? Are accurate similarities and differences being identified? <p>Disease timeline illustration</p> <ul style="list-style-type: none"> - Clear evidence that the learner has linked their experience with disease to the new science that they have been taught <p>Brochure</p> <ul style="list-style-type: none"> - Assess whether the brochure has a main message and focus that is consistent. A clear main message is seen and the brochure is appropriately titled. - Accuracy – the brochure is scientifically accurate to the degree that the learners have been taught.
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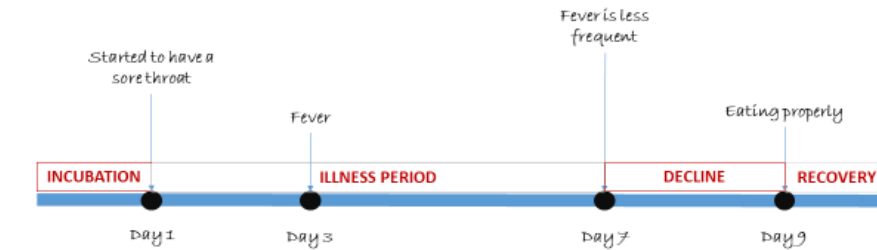
Learning outcomes:	<ul style="list-style-type: none"> ● Know that bacteria and viruses can cause disease. ● Understand how we work to prevent disease. ● Understand that a vaccine prevents disease and know what a vaccine contains. ● Know that our bodies produce antibodies to fight against disease when we get sick. ● Know how herd immunity works ● Learn how to write about science, ask scientific questions and think critically.
Required previous learning:	Concept of living and non-living organisms
Inspiration:	EAA
Additional enrichment activities:	<p>Students can write and present the following (literacy extension):</p> <p>Imagine and describe yourself creating a vaccine – what you would create it for? How would you go about making it? What will you name it? Whom will you share it with?</p> <p>Write a 1 page proposal describing your idea and thoughts. Then, present it to your fellow learners, friends and family.</p>
Modifications to simplify the project tasks if need be	If the learner is unable to write their own descriptions of the diagram they have drawn, encourage them to verbally share what their diagram depicts. Additionally, the facilitator can create a fill in the blanks worksheet so the learner has to pick the correct word to describe each illustration instead of writing the entire description themselves.

Ages 11 to 14 (Level 3)

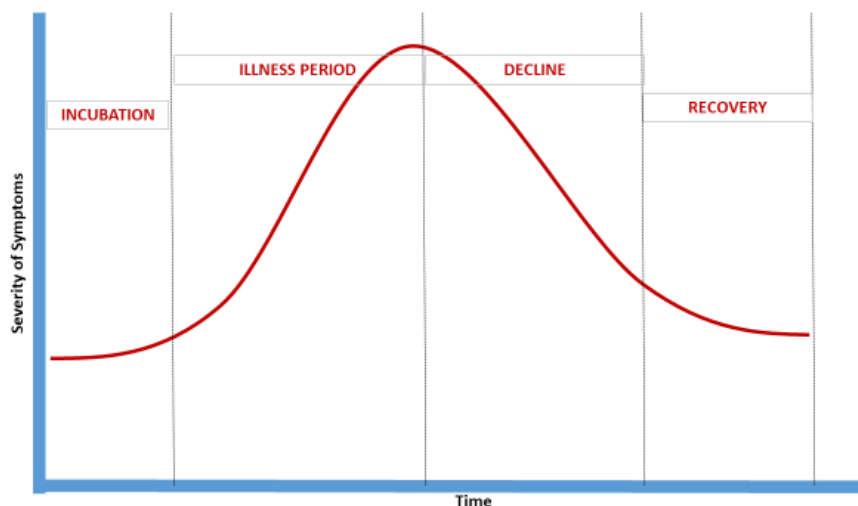
Description:	Learners will understand what an infection is and how vaccines play a role in reducing infection rate.
Leading question:	How do vaccines work?
Age group:	8-10 years
Subjects:	Science, Literacy and Numeracy
Total time required:	5 hours over 5 days
Self-guided / Supervised activity:	High Supervision
Resources required:	Paper, Pencil, Eraser

Day	Time	Activity and Description
1	10 minutes	<p>The learner will learn the cycle of infection and what an infection is</p> <p>Learners discuss and share their experiences with getting sick and how the infection developed. Ask the following questions:</p> <ul style="list-style-type: none"> ○ Do you remember the last time you fell ill? ○ How did you feel? ○ What could you and couldn't you do? <p>Activity: Learners are asked to draw a timeline of when they fell sick, labelling specific symptoms and feelings based on the discussion. Make it as detailed as possible, an example is shown below:</p>  <p>The facilitator draws focus to the main stages in the learners' timeline and labels them as follows:</p> <ul style="list-style-type: none"> ○ Incubation – exposure to bacteria or virus (this might have not been said by the learners) ○ Illness period – period of high symptoms ○ Period of decline – reduction in symptoms ○ Recovery – period to gain back strength

15
minutes

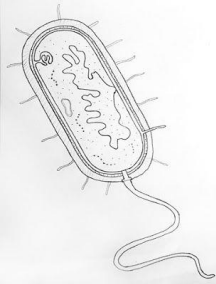
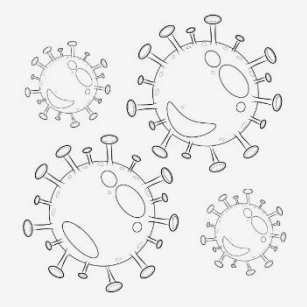
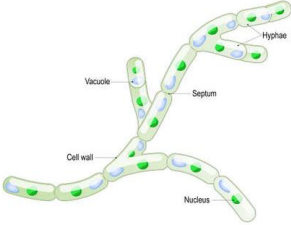


- In groups of 2, learners develop their own graph of how they perceive the infection to progress with regards to symptom severity.
 - The y axis is severity of symptoms and the x axis would represent the passage of time. So for example, the students will have to think and plot on the graph that at the start of the disease the symptoms might not be as severe, it then increases to a peak stage in the middle and reduces in severity towards the end.
 - Learners are to draw an upward slope if the severity of symptoms increases and a downward slope if the severity reduces. If there is no change in the severity of symptoms, draw a horizontal line.
- Learners present their graphs to each other and explain their reasoning
- An example graph:



20
minutes

- Activity to introduce microorganisms – name the animals/living organisms present in these locations:
 - Garbage (Cats, rodents, ants, roaches)

		<ul style="list-style-type: none"> ○ Water (Whales, sharks, fish, plants) ○ Human hair (Lice, bacteria) ○ Inside our body (Bacteria, viruses, fungi) <ul style="list-style-type: none"> ● Define microorganisms: Microorganisms (bacteria, viruses, fungi) are tiny, unseen living cells that can cause good or harm to our bodies. ● Learners are to classify these microorganisms as good or bad: <ul style="list-style-type: none"> ○ Bacteria that help make milk to cheese ○ Fungus that helps make penicillin ○ COVID-19 virus that causes sickness and death in some people ○ Fungus (yeast) that helps us make bread ○ Bacteria in water that causes people to get disease ○ Bacteria in our gut that helps with digestion ● Learners are to draw one out of the 3 different microorganisms: <div style="display: flex; justify-content: space-around; text-align: center;"> <div data-bbox="407 976 519 1003"> <p>Bacteria</p>  </div> <div data-bbox="753 976 821 1003"> <p>Virus</p>  </div> <div data-bbox="1078 976 1177 1003"> <p>Fungus</p>  </div> </div> <ul style="list-style-type: none"> ● Learners are to determine what other learners drew (classifying as one of the three microorganisms). ● This session should inform learners that bacteria, virus and fungi can all cause disease.
5 minutes		<ul style="list-style-type: none"> ● Discussion question: How do you think these microbes enter our body? Some ways include, through touch, through bodily fluids (blood and mucus), through contaminated food and water, through the air etc.
10 minutes		<ul style="list-style-type: none"> ● Learners participate in an infection activity to learn how fast an infection can spread from one person to another: <ul style="list-style-type: none"> ○ The learners walk around freely

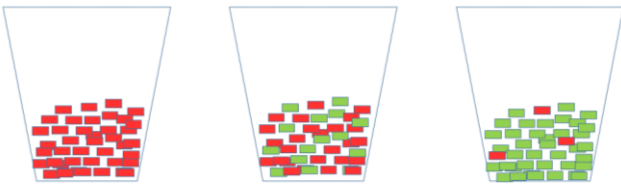
		<ul style="list-style-type: none"> ○ One learner is given a sheet of colored paper ○ When this learner meets other learners at arms distance away, they tear a piece off their paper and hand it to them ○ When the facilitator randomly calls out “multiply” every paper in the learner’s hand is torn into two. ○ Any paper in the learner’s hands can be given to another learner when learners come into close proximity to one another (so long as they have at least one left in their hand). ○ The activity ends when everyone has at least one piece of paper and are therefore all “infected”. <ul style="list-style-type: none"> ● Debrief: Facilitator explains that “multiply” is to mimic bacterial multiplication/reproduction and that the activity is an illustration of how fast disease can spread within a community of people. ● Reflection questions are conducted by the facilitator. The learners are asked the following questions: <ul style="list-style-type: none"> ○ Imagine the paper was bacteria, how long would the disease take to spread in our community? ○ If there is disease in our community, how can we make sure the spread is slower? ○ What did you learn from this activity about how disease spreads?
2	<p>5 minutes</p> <p>5 minutes</p>	<p>Learners will learn what a vaccination is</p> <ul style="list-style-type: none"> ● Discussion question: What does it mean to be vaccinated? <ul style="list-style-type: none"> ○ A vaccination is a preventative measure taken through an injection of part of a microorganism. This helps our body to prepare for a real infection, if that were to happen. ● Facilitator hands out a piece of paper to each student and requests that they write down “yes” or “no” to if they’ve ever been vaccinated ● The paper is folded up and handed in, the facilitator then counts how many of each set exists ● A brief discussion is had on reasons why some people vaccinate, and others do not. For example, <ul style="list-style-type: none"> ○ Reasons people vaccinate: <ul style="list-style-type: none"> ▪ It provides immunity against fatal diseases ▪ Vaccines are safe and tested

	20 minutes	<ul style="list-style-type: none"> <ul style="list-style-type: none"> ▪ A greater percentage of vaccinated than unvaccinated means that diseases would spread slower ○ Reasons people do not vaccinate: <ul style="list-style-type: none"> ▪ The vaccine might not be tested for compatibility with other medication people take for chronic disease ▪ Religious reasons ▪ Mistrust of science ● Discussion question: How many of you have had chickenpox or know someone who has? Did you or that person get it for the second time? Did you know that, in most cases, people only get chickenpox once in their lifetime! ● Introduce the idea that our bodies are able to “remember” bacteria and viruses and respond faster the second time because our body knows how to fight the disease. ● An activity to illustrate memory response is conducted: <ul style="list-style-type: none"> ○ The facilitator carries a tray containing 10 household objects. ○ The tray is covered with a cloth. ○ The learners are allowed to look at the tray without the cloth for 15 seconds before the cloth is put back on. ○ The learners are to list the objects from memory. ○ The learners then get another 15 second look at the tray and list down the objects from memory. ○ The learners determine how many correct objects were recalled from memory both times. ○ The activity is repeated once with different objects. ● A discussion is had and learners are asked to discuss the type of situation in which the students’ response was more accurate. <ul style="list-style-type: none"> ○ Students are able to respond more accurately in the instance where they had seen the objects before (not for the first time) ○ In which instance were the students able to list the objects faster?
	15 minutes	<ul style="list-style-type: none"> ● Based on the previous activity, learners are introduced to the following concepts: <ul style="list-style-type: none"> ○ The second time learners saw the set of objects, the response was faster and more accurate; this is what a <i>memory response</i> is in our body. If our body has seen the disease before, it can respond faster and have us sick for a shorter time.

	15 minutes	<ul style="list-style-type: none"> ○ When there was a different set of objects, the response had to be different; this is <i>specificity</i>. Every disease requires our body to respond differently. ○ Key takeaway: If we have been exposed to the disease before, our response is faster than if it is our first time and every infection has its own specific response requirements. <ul style="list-style-type: none"> ● Students are told that vaccines contain a <i>harmless part</i> of the bacteria that causes infection. ● A vaccine (pseudo infection) is injected into the body so that our body gets prepared with a response in the event that a real infection were to happen. We are introducing our body to the infection. ● A brief discussion on specificity is had where the learners are taught that each infection requires its own response in order for the infection to go away <p>Vaccines are common in our society today but who created the first vaccine and how was it done?</p> <ul style="list-style-type: none"> ● In 1796 Edward Jenner created a vaccine against smallpox virus through observation. ● Smallpox was a disease with about a 17% fatality rate and is one of the very few diseases to be completely eradicated through vaccination. ● Edward Jenner noticed that those who had contracted cowpox (a different disease) did not contract smallpox. ● Can you think of possible reasons why? ● The vaccine for smallpox contains parts of the cowpox virus in order for people's bodies to create fighters against the disease ● When the person is then exposed to smallpox their body is prepared!
3	15 minutes	<p>The learner will learn about different types of vaccines and how vaccines affect the infection cycle.</p> <ul style="list-style-type: none"> ● In groups of 2, learners conduct a dialogue between a "human body" and an "infection" as the infection tries to invade the body (the presentation can take any turn; successful infection or the body fights off the infection).

	10 minutes	<ul style="list-style-type: none"> ● Learners then switch roles taking turns to play the “infection” and the “human body”. ● At the end of the activity each group briefly presents a summary of their conversations to the rest of the group. ● Learners are introduced to the different types of vaccines: <ul style="list-style-type: none"> ○ Inactivated vaccines (dead version of the microorganism). This requires booster shots throughout. Some examples include rabies and flu. ○ Live vaccines (weakened form of the microorganism). This provides more long term immunity against the disease. Some examples include measles and chickenpox. ○ mRNA vaccines (causes our body to produce proteins that cause an immune response). The example is the COVID-19 vaccine.
	15 minutes	<ul style="list-style-type: none"> ● Learners are asked to come up with an informed guess (in groups of 2) of how each stage is affected by a vaccine and why. ● The theories are presented to the rest of the group ● Learners are to order the flashcards based on the vaccine mechanism sequence. Have one flash card for each of the following statements: <ul style="list-style-type: none"> ○ Person takes the vaccine for a specific virus X ○ The person’s body creates “fighters” against this specific virus and stores these fighters. ○ After some time the person is exposed to virus X ○ Virus X enters the body through the mouth ○ The person’s body recognizes the virus because they were exposed to it through the vaccine ○ The person’s body has already made “fighters” against virus X so deploys these “fighters” or white blood cells. ○ The virus is fought off by the white blood cells and the person is only sick for a very short amount of time or is not sick at all.

	20 minutes	<ul style="list-style-type: none"> ● Literacy extension - Learners are to write a newspaper article based on the prompt below: <ul style="list-style-type: none"> ○ A new vaccine has been discovered and you are a reporter writing an article on it. Make sure it is factual and contains the type of vaccine that it is, details on who discovered it and information on the benefits of vaccinations. ● Learners can pick between the COVID-19 vaccine, the MMR vaccine, the polio vaccine and the chickenpox vaccine.
4	<p>15 minutes</p> <p>5 minutes</p> <p>25 minutes</p>	<p>Today learners will participate in the Infection Tracking Activity and understand herd immunity</p> <ul style="list-style-type: none"> ● Students share with each other the effect that vaccines have on infection progress ● Students are introduced to the term <i>herd immunity</i> meaning resistant to (a particular) infection as a result of many in the community being immune. ● Infection Tracking Activity setup <ul style="list-style-type: none"> ○ One student is “infected” but the students do not know which student among them is infected (this student is given red colored pieces of paper in a bag) ○ The rest of the community are infection-free (these students also have plastic bags with paper, but their papers are white) ○ One person from the community has been “vaccinated” (this information is only known by that particular individual and the facilitator) ● Infection Tracking Activity <ul style="list-style-type: none"> ○ The students are encouraged to greet one another and mimic daily activities. Each time an interaction occurs, students swap paper ○ The vaccinated student accepts red paper when given but should discard it ○ When an infection-free student is handed red paper, they are also now infected and should tear pieces of this paper to hand out to other students during interactions ○ Round one ends when each student has spoken to at least 75% of the class

	<p>15 minutes</p>	<ul style="list-style-type: none"> • Students then sit in a circle and the facilitator asks the infected students and the vaccinated student to reveal themselves • A brief discussion is had on the effectiveness of one student being vaccinated in the group • The activity and the discussion are repeated with one more student vaccinated each round until a at least 75% of the students have been vaccinated. <p>Numeracy extension:</p> <ul style="list-style-type: none"> • Students are introduced to the concept of herd immunity, where a significant portion of the community are vaccinated in order to curb the spread of infection. <ul style="list-style-type: none"> ○ Label 3 opaque buckets or baskets, with the tags “0%, 50% and 95%”. ○ For this numeracy extension red paper is unvaccinated and green paper is vaccinated. ○ In the 0% bucket place 60 torn up small pieces of red paper, in the 50% bucket place 30 red papers and 30 green papers, in the 95% bucket place 3 red papers and 57 green papers. The illustration below shows an example: <div style="text-align: center;">  <p style="display: flex; justify-content: space-around; margin-top: 5px;"> 0% 50% 95% </p> </div> <ul style="list-style-type: none"> ○ Students are to have a sheet of paper each and they are acting as the infection. ○ Each student takes a turn dipping their hands, while closing their eyes, into each bucket and taking a handful of papers. They write down and calculate the percentage of red and green papers they have. ○ Reflection question: How many “people” were they able to infect in each case? What is the effect of having more people in our community vaccinated? If more people are vaccinated what does that do to the chances of getting the disease? If more people are vaccinated can the disease still spread at the same rate?
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Learning outcomes:	<ul style="list-style-type: none"> • Understand the cycle of infection • Understand what bacteria are and that bacteria can cause infection • Understand what a vaccine is and how it speeds up our response to infection
Required previous learning:	<ul style="list-style-type: none"> • Concept of living and non-living organisms • Understanding that living organisms are made up of cells
Inspiration:	EAA
Additional enrichment activities:	<p>Students can prepare the following: (Literacy Extension)</p> <ul style="list-style-type: none"> - Write a speech on the topic “Should citizens pay to get vaccines in their country?” - Research and create timelines illustrating the origin of vaccines and their impact for any 2 diseases. <p>Students can learn more about how vaccines work by watching this video: https://www.youtube.com/watch?v=bqIXkienTSk</p>
Modifications to simplify the project tasks if need be	<p>If students do not understand percentages, the numeracy extension activity on Day 4 can be simplified by the facilitator putting the correct number of chits in each bucket beforehand.</p> <p>If students do not know how to plot points in a graph, the graph-related activity on Day 1 need not be conducted.</p>