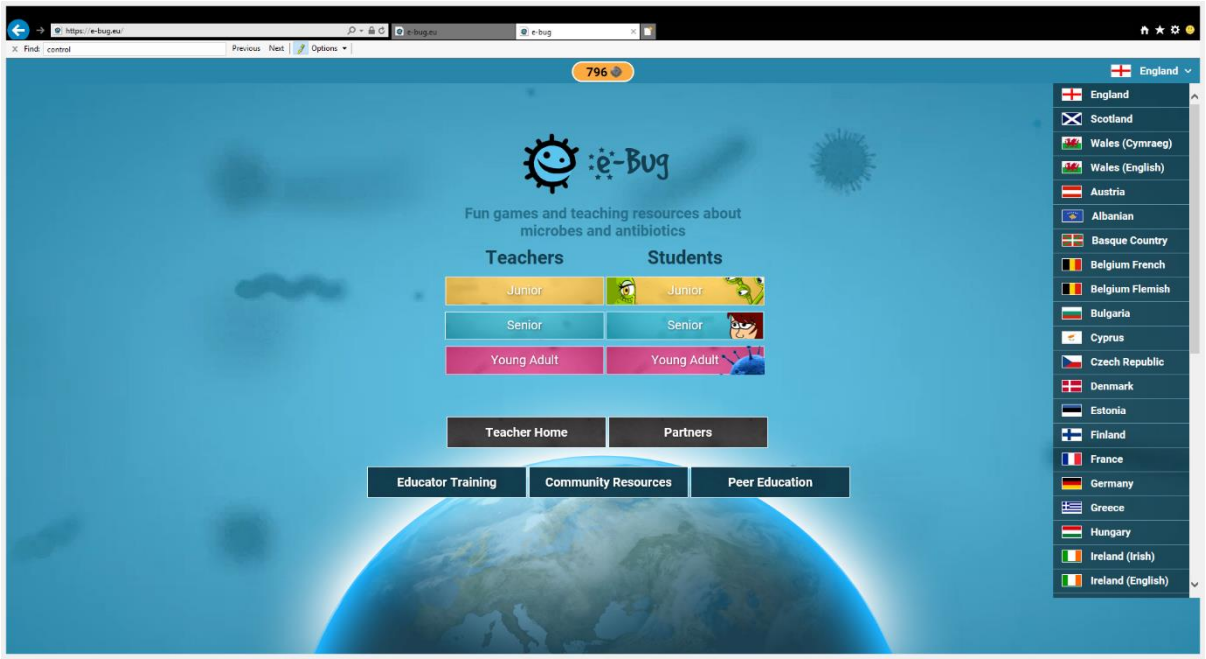
Layout of e-Bug lesson packs

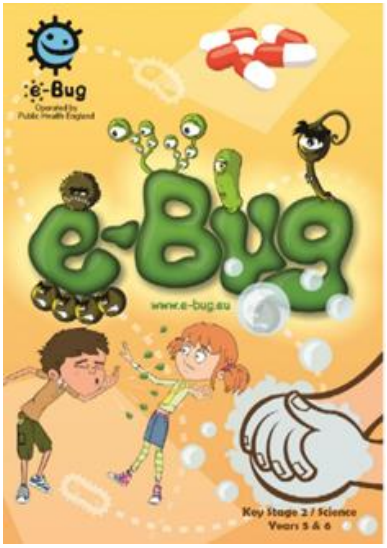
Before we begin it is helpful to have a basic overview of the e-Bug school and community packs and resources.

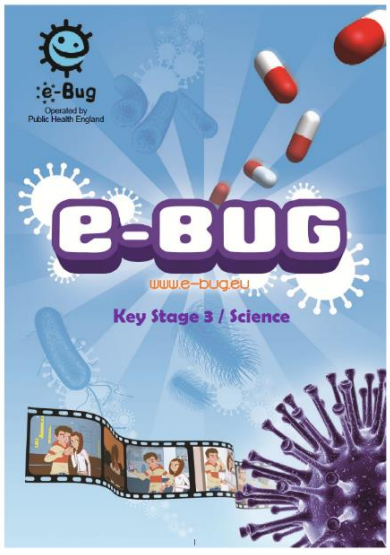
e-Bug is a curriculum supplement series that complies with the Department of Education and QCA educational standards for Junior and Senior schools. It also includes a six-week community course on hygiene and infection prevention (Beat the Bugs) for a range of different ages and abilities.

The e-Bug programme is supported by a website from which all the pack resources, and additional activities can be freely downloaded (www.e-Bug.eu). The website contains student games which have been evaluated and designed to teach key hygiene concepts, whilst being fun and interactive. We have over 26 global partners within the e-Bug consortium, mainly from European countries, and junior and senior resources have been translated into 24 languages, including Turkish and Arabic.



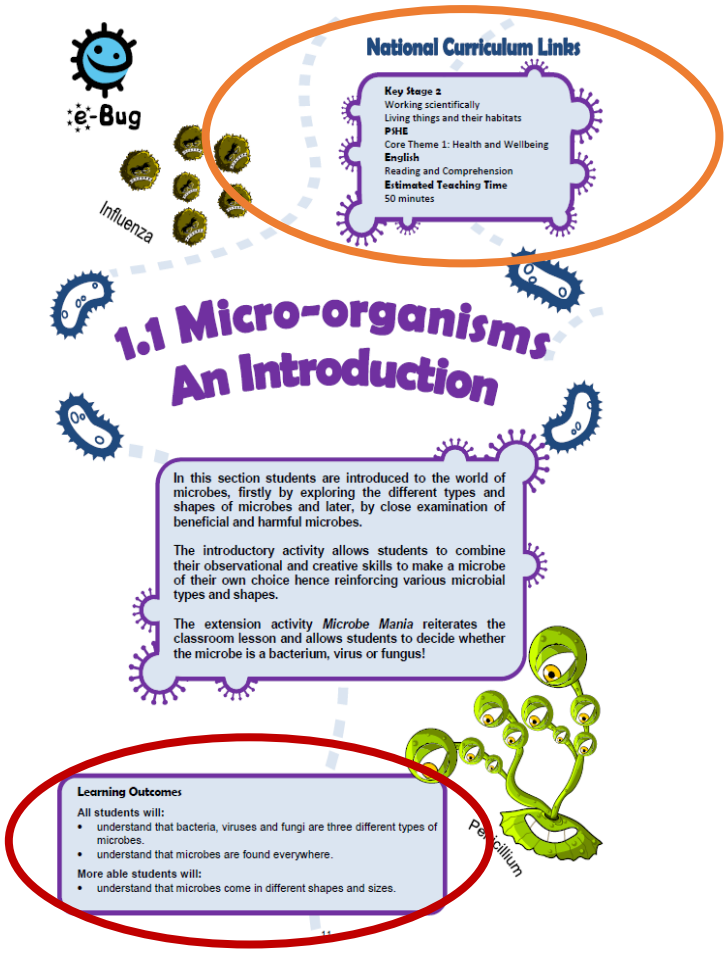
Left to right: e-Bug junior (KS2- 7-11 years), e-Bug senior (KS3 – 11-14 years), Beat the Bugs (communities including children and adults)

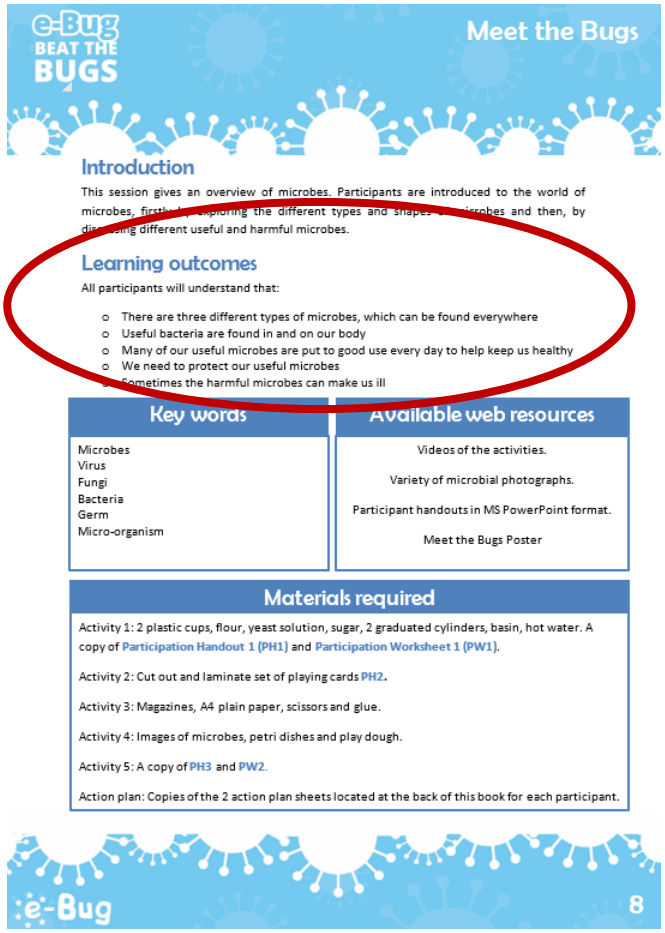




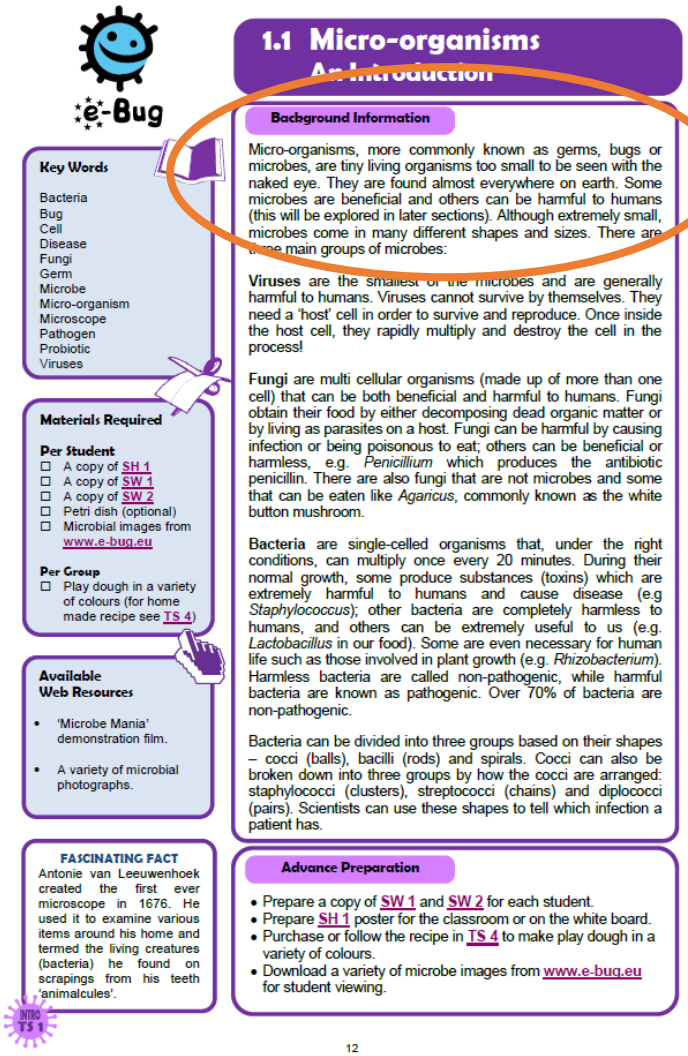
Each section of the packs includes the following things:

- curriculum links (for the school packs) and learning outcomes





- **background information** for educators



e-Bug

1.1 Micro-organisms

Background Information

Micro-organisms, more commonly known as germs, bugs or microbes, are tiny living organisms too small to be seen with the naked eye. They are found almost everywhere on earth. Some microbes are beneficial and others can be harmful to humans (this will be explored in later sections). Although extremely small, microbes come in many different shapes and sizes. There are three main groups of microbes:

Viruses are the smallest of the microbes and are generally harmful to humans. Viruses cannot survive by themselves. They need a 'host' cell in order to survive and reproduce. Once inside the host cell, they rapidly multiply and destroy the cell in the process!

Fungi are multi cellular organisms (made up of more than one cell) that can be both beneficial and harmful to humans. Fungi obtain their food by either decomposing dead organic matter or by living as parasites on a host. Fungi can be harmful by causing infection or being poisonous to eat; others can be beneficial or harmless, e.g. *Penicillium* which produces the antibiotic penicillin. There are also fungi that are not microbes and some that can be eaten like *Agaricus*, commonly known as the white button mushroom.

Bacteria are single-celled organisms that, under the right conditions, can multiply once every 20 minutes. During their normal growth, some produce substances (toxins) which are extremely harmful to humans and cause disease (e.g *Staphylococcus*); other bacteria are completely harmless to humans, and others can be extremely useful to us (e.g. *Lactobacillus* in our food). Some are even necessary for human life such as those involved in plant growth (e.g. *Rhizobacterium*). Harmless bacteria are called non-pathogenic, while harmful bacteria are known as pathogenic. Over 70% of bacteria are non-pathogenic.

Bacteria can be divided into three groups based on their shapes – cocci (balls), bacilli (rods) and spirals. Cocci can also be broken down into three groups by how the cocci are arranged: staphylococci (clusters), streptococci (chains) and diplococci (pairs). Scientists can use these shapes to tell which infection a patient has.

Key Words

Bacteria
Bug
Cell
Disease
Fungi
Germ
Microbe
Micro-organism
Microscope
Pathogen
Probiotic
Viruses

Materials Required

Per Student
- ☐ A copy of SH 1
- ☐ A copy of SW 1
- ☐ A copy of SW 2
- ☐ Petri dish (optional)
- ☐ Microbial images from www.e-bug.eu

Per Group
- ☐ Play dough in a variety of colours (for home made recipe see TS 4)

Available Web Resources
- 'Microbe Mania' demonstration film.
- A variety of microbial photographs.

FASCINATING FACT
Antonie van Leeuwenhoek created the first ever microscope in 1676. He used it to examine various items around his home and termed the living creatures (bacteria) he found on scrapings from his teeth 'animalcules'.

INTRO TS 1

Advance Preparation

- Prepare a copy of SW 1 and SW 2 for each student.
- Prepare SH 1 poster for the classroom or on the white board.
- Purchase or follow the recipe in TS 4 to make play dough in a variety of colours.
- Download a variety of microbe images from www.e-bug.eu for student viewing.

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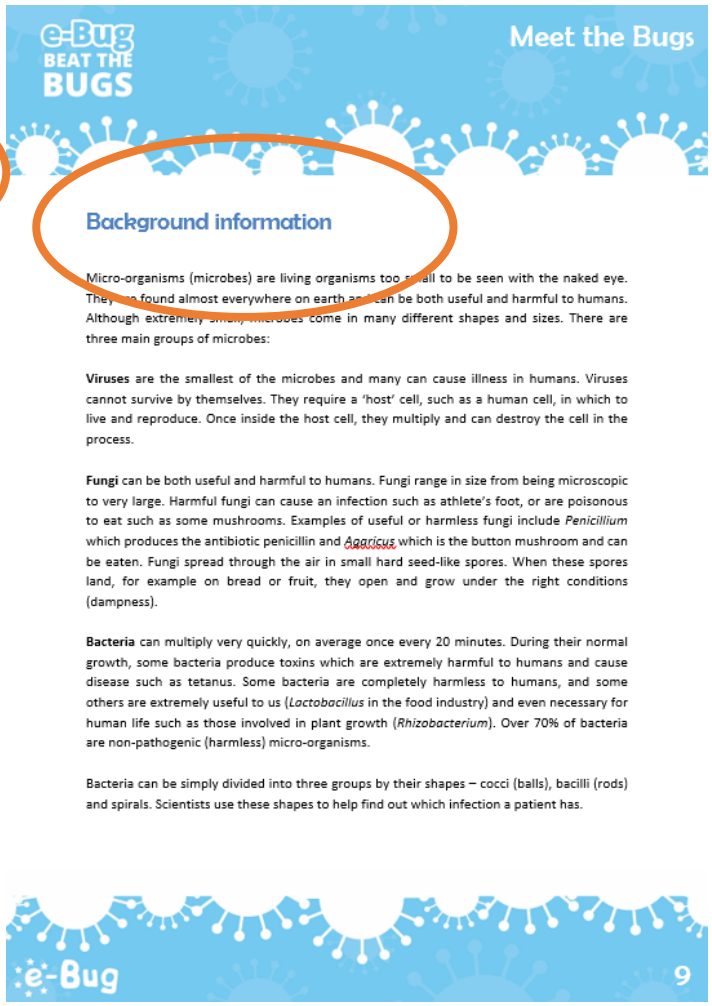

e-Bug BEAT THE BUGS

Meet the Bugs

Background information

Micro-organisms (microbes) are living organisms too small to be seen with the naked eye. They are found almost everywhere on earth and can be both useful and harmful to humans. Although extremely small, microbes come in many different shapes and sizes. There are three main groups of microbes:

Viruses are the smallest of the microbes and many can cause illness in humans. Viruses cannot survive by themselves. They require a 'host' cell, such as a human cell, in which to live and reproduce. Once inside the host cell, they multiply and can destroy the cell in the process.

Fungi can be both useful and harmful to humans. Fungi range in size from being microscopic to very large. Harmful fungi can cause an infection such as athlete's foot, or are poisonous to eat such as some mushrooms. Examples of useful or harmless fungi include *Penicillium* which produces the antibiotic penicillin and *Agaricus* which is the button mushroom and can be eaten. Fungi spread through the air in small hard seed-like spores. When these spores land, for example on bread or fruit, they open and grow under the right conditions (dampness).

Bacteria can multiply very quickly, on average once every 20 minutes. During their normal growth, some bacteria produce toxins which are extremely harmful to humans and cause disease such as tetanus. Some bacteria are completely harmless to humans, and some others are extremely useful to us (*Lactobacillus* in the food industry) and even necessary for human life such as those involved in plant growth (*Rhizobacterium*). Over 70% of bacteria are non-pathogenic (harmless) micro-organisms.

Bacteria can be simply divided into three groups by their shapes – cocci (balls), bacilli (rods) and spirals. Scientists use these shapes to help find out which infection a patient has.

e-Bug 9

- a **lesson plan** with **introduction**, **activity descriptions** and **plenary (school packs) or discussion questions (Beat the Bugs).** In addition to discussion question, Beat the Bugs also features an **action plan** at the end of each section.

1.1 Micro - organisms
An Introduction

Lesson Plan

Introduction

1. Begin the lesson by asking children what they already know about germs or bugs. Ask the children if they, or anyone in their family, have ever been sick? What was the disease and what do they think caused it?
2. Explain to the children that some diseases called infections are caused by germs and that germs are tiny living organisms called microbes. Show the children that there are three different types of microbes: bacteria, viruses and fungi. Use the colour poster provided (SH 1), which is also found on the e-Bug website (www.e-bug.eu), for whiteboard presentation format.
3. Explain that microbes are so small that they can only be seen through a microscope. Use the web activity or provide students with SH 2 to demonstrate the different sizes of microbes.
4. Emphasise that although some microbes cause disease, there are also beneficial microbes. Ask children to identify some useful microbes. If they cannot, provide examples for them e.g. *Lactobacillus* in yogurt and probiotics drinks, penicillin from fungi, yeast in bread, etc.
5. Highlight to the class that microbes can be found EVERYWHERE: floating around in the air we breathe, on the food we eat, on the surface of our bodies, in our mouth, nose and gut/tummy.

Main Activity

1. This activity can be done either individually or in groups.
2. Provide each group with either a colour handout (SH 1) of the different types of bacteria or place colourful posters on the classroom walls from the website www.e-bug.eu. These handouts will show the range of shapes and sizes of microbes and whether they are useful or harmful microbes.
3. Provide each group with play dough in various colours, petri dishes and a copy of SW 1.
4. Ask each child/group to recreate a microbe or groups of microbes in their petri dish based on the coloured images provided.
5. Each child must decide if their microbe is useful or harmful and provide its name. It is important to let the children get as creative as possible whilst taking into consideration the actual structure of microbes.
6. Remind the class that fungi are the largest microbes and viruses are the smallest.
7. If time permits, students can then present their microbes to the class.




INTRO TS 2

13

1.1 Micro - organisms
An Introduction

Lesson Plan

Plenary

Check for understanding by asking the children the following questions:

1. What are the most common types of microbe?
   There are three main types of microbes known as bacteria, viruses and fungi.
2. What are germs?
   A germ is another name used to describe a harmful microbe.
3. Where is a microbe found?
   Microbes are found EVERYWHERE, floating around in the air we breathe, on the food we eat, on the surface of our bodies, in our mouth, nose and gut/tummy.
4. Are all microbes harmful?
   No, although there are microbes which can be harmful to us there are also a lot of microbes that are very useful to us, for example, Saccharomyces (fungi) is a yeast that is used to help bread rise, Lactobacillus (bacteria) help make yogurt and cheese.
5. What are the different shapes of bacteria?
   Spirals (Campylobacter), Rods (Lactobacilli) and Balls (Staphylococcus).

Extension Activity

1. Provide each student with a copy of SW 2 and SH 1.
2. By reading the descriptions and using the information on their handouts students must decide whether the microbes are bacteria, virus or fungi.
   a. *Staphylococcus is a bacterium.*
   b. *Lactobacillus is a bacterium.*
   c. *Dermatophytes are fungi.*
   d. *Influenza is a virus.*
   e. *Penicillium is a fungus.*
   f. *Campylobacter is a bacterium.*

Cross Curricular Extension

1. The main activity can be done by creating **geometric microbes (maths)** or **knitted or felt microbes (art)** to cover alternative aspects of the curriculum. See the website for further information www.e-Bug.eu


Images:
Glasgow City of Science

INTRO TS 3

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e-Bug BEAT THE BUGS — Food Bugs

Discussion

Ask the participants what they have learnt today. Refer to the 'Food Bugs' poster in the discussion. Make sure the following areas are discussed:

- What causes food poisoning? *(bacteria)*
- How should you avoid getting food poisoning? *(Washing your hands, washing fruit and vegetables, cooking food thoroughly, storing food correctly)*
- How should food be stored in the fridge? *(see group leader answer sheet)*
- When should you wash your hands? *(Before preparing food, after using the toilet, after touching pets)* And kitchen surfaces? *(Before and after preparing food)*
- What food labels do you remember? (*use by, best before etc.*)
- Should you go to work with vomiting or diarrhoea if you handle food in your job? *(No you should be well for 2 days before returning to work)*

Ask the participants what they will do differently now at home?

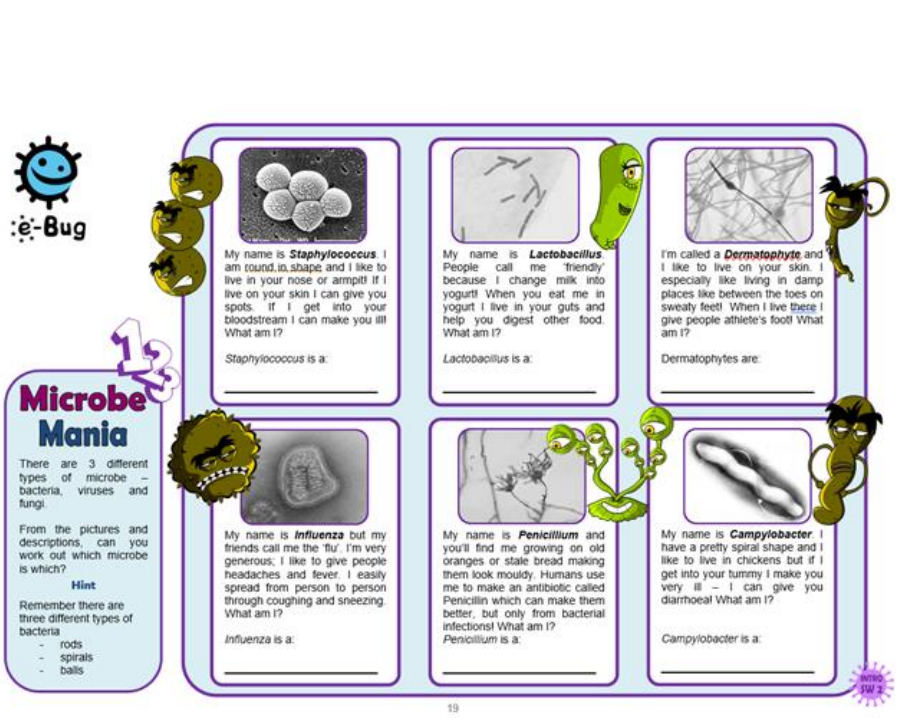
Action Plan

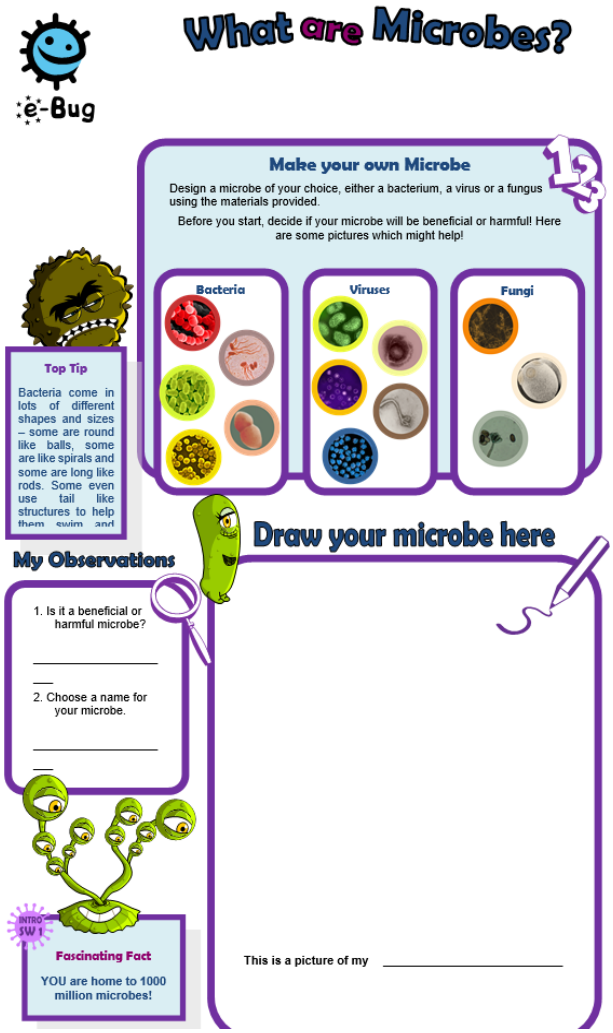
Discuss with participants if they stuck to their action plan from the last session. If they did, how did they do this and if not, why.

Then ask participants to complete their action plan for this session. Hand out the individual pocket sized sheet for participants to keep for themselves as well as the full sized sheet to be returned to the group leader. This worksheet will be used again in the final session.
Ask participants to either choose one of the action plans from below or to make up their own if they are confident enough.

1. Reduce chance of food poisoning by:
   a. Washing hands before and after handling food such as chicken or dirty fruit or vegetables.
   b. Clean kitchen surfaces and utensils before and after preparing food.
   c. Not eating food that has been out of the fridge for more than 8 hours.
   d. Washing fruit and vegetables before eating them.
   e. Not eating food that is past its use by date.

- modifiable **student worksheets** (SW) or **participant worksheets** (PW) and **student handouts** (SH) or **participant handouts** (PH) that coincide with the activities. **Educator sheets** are also available within Beat the Bugs which include answers to activities.





Educator Sheet 1

Right or Wrong?

Below are the answers to the Antibiotics 'Right or Wrong?' worksheet.

Statement	Right or Wrong	Reason
He was coughing and sneezing everywhere. You would have thought the doctor would have given him antibiotics!	Wrong	Most common infections will get better by themselves through time, bed rest, liquid intake and healthy living. Antibiotics do not work on viruses.
My doctor told me to take my antibiotics for 7 days so that is what I did.	Right	Take antibiotics exactly as given by your doctor or nurse.
When my friend was ill, I gave her my old antibiotics. I like helping my friends.	Wrong	You must not use other people's or any leftover antibiotics.
Antibiotics don't help coughs and colds; you just need bed rest, lots of fluids and eat healthy.	Right	Most common infections will get better by themselves through time, bed rest, liquid intake and healthy living. Antibiotics do not work on viruses.
All drugs are bad for you. I can't see the point in taking antibiotics.	Wrong	Antibiotics can help severe infections such as meningitis, pneumonia or kidney/urine infections.
My doctor gave me antibiotics to take for 7 days but I feel better after 3 days so I'm going to stop taking them.	Wrong	Take antibiotics exactly as given by your doctor or nurse. Even if you feel better after 3 days you might still have the infection.
My headache and flu symptoms are really getting me down. I think I need antibiotics!	Wrong	Most common infections like flu will get better by themselves through time, bed rest, liquid intake and healthy living. Antibiotics do not work on headaches or viruses.
I don't take antibiotics unless I really need them as they might not work in the future.	Right	If you over use antibiotics they might not work when you really need them for a severe infection.

Participant Worksheet 1

Right or Wrong?

Discuss: Which of these statements are right or wrong?

1. He was coughing and sneezing everywhere. You would have thought the doctor would have given him antibiotics!
2. My doctor told me to take my antibiotics for 7 days so that is what I did.
3. When my friend was ill, I gave her my old antibiotics. I like helping my friends.
4. Antibiotics don't help coughs and colds; you just need bed rest, lots of fluids and eat healthily.
5. All drugs are bad for you. I can't see the point in taking antibiotics.
6. My doctor gave me antibiotics to take for 7 days but I feel better after 3 days so I'm going to stop taking them.
7. My headache and flu symptoms are really getting me down. I think I need antibiotics!
8. I don't take antibiotics unless I really need them as they might not work in the future.