

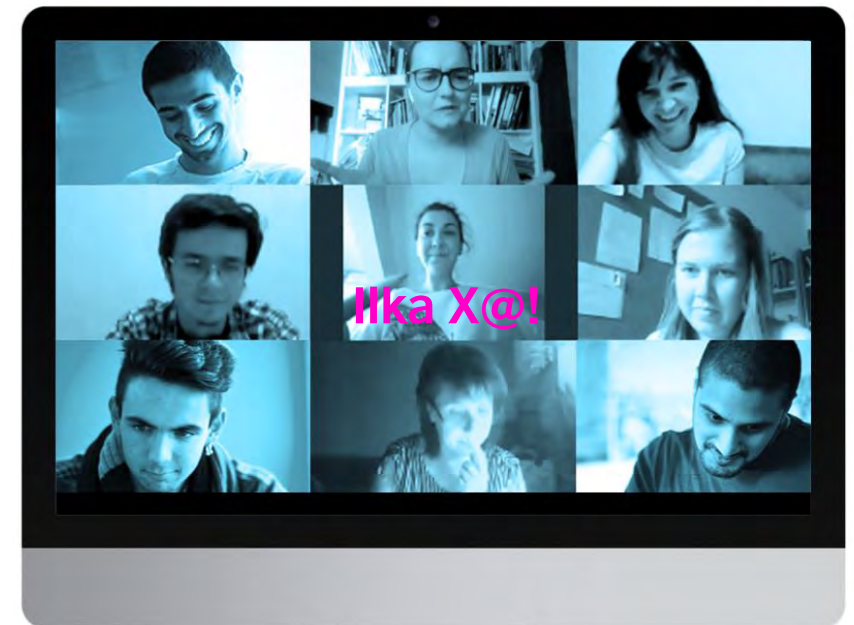
# Solutions

**Theme:**  
**Science, Space, and Technology**



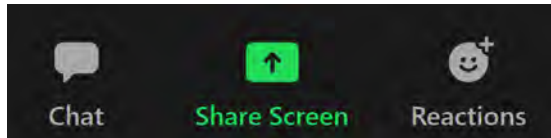
## Before we start, please make sure...

- ✓ your name on Zoom is clear (use Latin letters)
- ✓ your camera is on and mic is off (unmute when needed)
- ✓ you are in a quiet area that helps you focus
- ✓ you have a notebook or a note app ready to take notes



# Zoom for learning

## Ask questions in the Chat



Use reactions to show that you are ready, you understand or like something someone said



## Use Annotate when a screen is shared



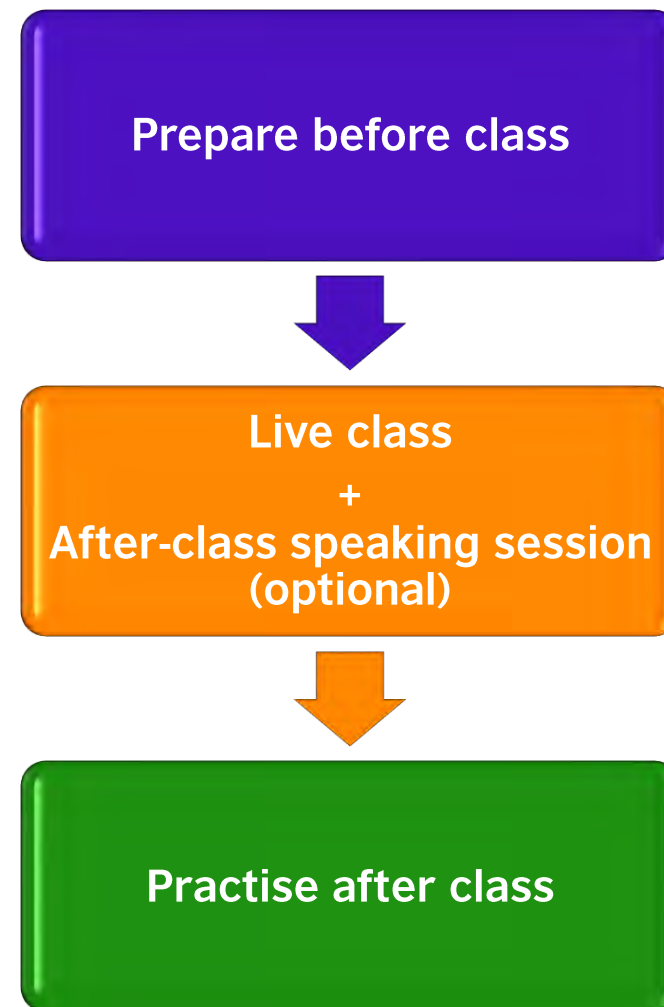
Use Save to make screenshots

# Welcome to English Online



## How does it work?

You need to complete all three parts to get the most out of English Online.



# After-class speaking session

Stay back after class for 5 or 10 minutes to talk to your classmates from around the world.

**This extra speaking practice will help you...**

- improve your conversation skills
- practise using language learnt in class
- support and help your fellow students
- practise using English in a natural context
- become a part of a global learning community



After-class  
speaking  
sessions

# Lesson objective

## Solutions

In this lesson, you will give a short talk from notes about a technological innovation and how it works. You will read a typical 'popular science' article, and discuss the applications of the technology described. You will practise the language of speculating, and other relevant structures for describing scientific developments, such as passive forms and -ing forms.

### **Lesson objective**

Explaining and discussing scientific advances



**live  
class**



# Have you done the Prepare and Practise activities?

## Prepare



An article about implant surgery

## Practise



The passive and passive infinitive



Practice of using the passive

# Lead-in

What do you know about nanoscience and nanotechnology?

Can you complete the text below?

Nanotechnology can be described as a .....<sup>1</sup> science involving the study and manipulation of .....<sup>2</sup> at the .....<sup>3</sup> and atomic level.

Scientists work on the .....<sup>4</sup>, which is impossible to see with a standard light .....<sup>5</sup>. Modern nanotechnology as we know it began in 1981 when a microscope that could see individual .....<sup>6</sup> was developed.

'Nano' as a numerical prefix means a billion, hence a nanometer is a .....<sup>7</sup> of a metre. A sheet of newspaper is 100,000 nanometers .....<sup>8</sup>. It takes a fingernail a .....<sup>9</sup> to grow a nanometer.

Molecules can be .....<sup>10</sup> to build materials with extraordinary .....<sup>11</sup> and behaviours, unique to the materials' nanoscale proportions.

One example of the current .....<sup>12</sup> of nanoparticles is in sunscreens. Their small size allows the cream to spread more easily and they are transparent rather than white.



# Lead-in

What do you know about nanoscience and nanotechnology?

Can you complete the text below?

Nanotechnology can be described as a **multidisciplinary**<sup>1</sup> science involving the study and manipulation of **matter**<sup>2</sup> at the **molecular**<sup>3</sup> and atomic level.

Scientists work on the **nanoscale**<sup>4</sup>, which is impossible to see with a standard light **microscope**<sup>5</sup>. Modern nanotechnology as we know it began in 1981 when a microscope that could see individual **atoms**<sup>6</sup> was developed.

'Nano' as a numerical prefix means a billion, hence a nanometer is a **billionth**<sup>7</sup> of a metre. A sheet of newspaper is 100,000 nanometers **thick**<sup>8</sup>. It takes a fingernail a **second**<sup>9</sup> to grow a nanometer.

Molecules can be **manipulated**<sup>10</sup> to build materials with extraordinary **properties**<sup>11</sup> and behaviours, unique to the materials' nanoscale proportions.

One example of the current **application**<sup>12</sup> of nanoparticles is in sunscreens. Their small size allows the cream to spread more easily and they are transparent rather than white.

# Language focus 1: correct the errors

- 1 Even though it may prove difficult for the technology to implement, develop the applications remains a high priority.  
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- 2 If lab executives don't mind results delaying, the technicians have confirmed that all checks are complete by year's end.  
-----
- 3 Nurses do not have to remind of the importance of maintain hygiene on post-operative wards.  
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- 4 Thousands of people thought to be affect by post-implant pain, despite their receive the most up-to-date treatment.  
-----
- 5 The technology not believe to be dangerous, although various scare stories have circulate by the media.  
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- 6 Further breakthroughs are hope imminent, but we should avoid the risk of carry away by over-confidence.  
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# Task



# Task

Work in groups. Read about one application of nanotechnology on the prompt card your teacher will give you. Explain it to your group without reading from the card. Then discuss the following:

- 1 Which application of nanotechnology seems most useful and why?
- 2 Which is least important or valuable? Why?
- 3 Can you think of any possible problems with any of these technologies? What?

Report back to the class on your discussion.



# Card A

## Nanofabrics

Nanotechnology is already being incorporated into everyday clothing available from high-street chains. A number of different particles are in common use.

Microbe-killing silver releases positively charged ions that kill bacteria and prevent bad odours. Nanoparticles of silica are used to coat textiles because the angle and roughness of their texture repel water and staining liquids, causing them to form beads and roll off the fabric.

Titanium dioxide and zinc oxide, having been sprayed onto fabric, scatter ultraviolet rays and stop you being sunburnt through your clothing.

Finally, nanoparticles that conduct electricity, such as zinc oxide, have been woven into synthetics like nylon and polyester to prevent them from gathering static charge, and making your hair stand on end.

There are some potential risks: the nanoparticles which have been shed from the skin through sweating can be toxic to aquatic life, and this might be a problem if huge amounts are deposited in the residue from water waste treatment plants.

## Card B

### Food Storage

Nanoparticles can be used in a number of ways in food packaging to prevent food from being spoiled.

Particles of nanoclay are embedded in the plastics used for food packaging: this reduces the amount of water vapour that can penetrate them, so the contents stay fresher for longer.

They also help to prevent bacterial contamination, as water vapour is needed for the growth of micro-organisms.

The nanoparticles biodegrade faster, so the packaging can be more easily recycled.

Nanosilver particles, which are already used in wound dressings, are also incorporated in packaging because they are highly toxic to bacteria so food lasts longer.

These nanoparticles don't migrate from packaging into food, so it is very unlikely that consumers would be affected by them.



## Card C

### Solar Panels

Black metals with a nanostructured surface might be used to create more effective solar panels. The metals are made by roughening them at the nanoscale to create an uneven surface. This ensures more light is absorbed because the surface does not reflect it.

The development of this technology allows solar panels to be set up anywhere and not just in high-sunlight locations.

Scientists have also been able to “tune” the material, meaning the amounts of solar energy stored can be adjusted, increasing or decreasing the levels on demand.

Making solar cells is thought to be the next step. The idea is to create an affordable solar paint which could be applied to the surface of any building, permitting electricity to be produced in whatever quantities may be required.

## Card D

### Cleaning Up Nuclear Waste

Nanoparticles of graphene oxide have been found to have a remarkable ability to remove radioactive material from contaminated water. The particles bind quickly to natural and human-made radioactive particles and condense them into solids, which can then be collected and burned. A radioactive cake is left at the end of the process, which can be reused safely.

Without nanoparticles, it is very difficult to remove radioactive ions from huge pools of radioactive water such as at Fukushima, Japan, and the water can't be put back into the ground. It has to be shipped at great expense to safe repository sites around the country, so the ability to filter out contaminants on-site makes it much cheaper and quicker to clean up nuclear waste.

# Feedback

Mixed conditionals  
second and third

# Review

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# Lesson materials

## Make sure you have

- downloaded the \*.pdf with this presentation
- saved the Zoom Chat



# How can you make more progress?

Complete the Progress activities online.





# What's next?

New

## Science, Space and Technology

6 lessons

The importance of science and technology today is undeniable. Explore some advances in technology and their applications, past events that have not been explained, changing trends and controversial issues in technological advance. Space exploration is developing rapidly. We also explore some interesting aspects of this fascinating topic including future life on Mars, asteroid prevention strategies, the Apollo moon landing and the possibility of alien life.



Solutions



Theories



The way things are  
going



Gadgets



Moon landing



Asteroids and  
meteorites

# After-class speaking session

**You can talk about any topic that interests you!**

**Use these questions as a guide, if needed.**

- In which other areas do you think nanotechnology might have an impact?
- Are you interested in scientific developments? Why?
- How do most people find out about technological developments?
- Should governments fund scientific research?
- What areas of science do you think attract too much / too little funding?

**For help, contact:**

**[support.englishonline@britishcouncil.org](mailto:support.englishonline@britishcouncil.org)**

English Online | [www.britishcouncil.org](http://www.britishcouncil.org)

## **Dos**

- ✓ Treat everyone with respect
- ✓ Keep your camera on and participate
- ✓ Let others share ideas too
- ✓ Listen to everyone
- ✓ Click 'Leave' if you cannot stay back

## **Don'ts**

- ✗ Don't take pictures or record
- ✗ Don't share personal details
- ✗ Don't let your children be visible onscreen

After-class  
speaking  
sessions

