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Innovation and technology



American rock climber,
engineer and biophysicist,
Hugh Herr at Quincy
Quarries near Boston, USA

TED TALKS

DAVID SENGEH grew up in Sierra Leone, where many people became amputees in the civil war there. When he noticed that people weren't wearing their prosthetic limbs, he investigated the reasons for this and then, as part of his PhD. at MIT (Massachusetts Institute of Technology), he tried to work out a solution to the problem.

David Sengeh's idea worth spreading is that those who have a disability should have the opportunity to live active, enjoyable lives – beginning with more comfortable prosthetics.



BACKGROUND

1 You are going to watch an edited version of a TED Talk by David Sengeh called *The sore problem of prosthetic limbs*. Read the text about the speaker and the talk. Then work in pairs and discuss the questions.

- 1 What problems do you think amputees might face in everyday life?
- 2 David Sengeh was able to solve a problem for amputees using technology. How could these areas also help with the problems you discussed in question 1?

housing	access to information	legal changes
financial aid	transport	

- 3 What kinds of skills do you think define the kind of person who finds solutions to problems?

KEY WORDS

2 Read the sentences (1–6). The words in bold are used in the TED Talk. First guess the meaning of the words. Then match the words with their definitions (a–f).

- 1 A **prosthesis** takes the place of a missing limb for amputees.
- 2 A patient who can't change the position of their body easily can get **pressure sores**.
- 3 The **magnetic resonance imaging (MRI)** scan showed where my leg was broken.
- 4 When a person's arm comes out of their shoulder **socket**, it's quite easy to put it back into place.
- 5 Patients who have to spend a lot of time in bed find that **pillows** can make them more comfortable.
- 6 Paralympic athletes compete in sports classified by their **disability**, such as sight problems or being an amputee.

- a an artificial part of the body
- b a type of medical technology that takes pictures of the body
- c soft cushions
- d painful damage to the skin
- e a cup-shape part of a device that another part fits into
- f a physical or mental condition that can affect the way a person functions

AUTHENTIC LISTENING SKILLS

Dealing with accents

You will hear many different accents from both native and non-native English speakers. There are ways that you can prepare yourself so that you find it easier to understand different accents: for example, by listening to speakers on the Internet, on the radio and in films. Non-native speakers often find it easier to understand other non-native speakers than native speakers do.

3a 36 Work in pairs. Look at the Authentic listening skills box. Then listen to the beginning of the TED Talk. Did you find any aspect of David Sengeh's English different from the spoken English you're used to? Tell your partner.

- the pronunciation of some of the words?
- the stress and rhythm of his speech?
- something else?

3b 36 Listen to the beginning of the talk again. Underline the parts that sound different from what you expected.

'I was born and raised in Sierra Leone, a small and very beautiful country in West Africa, a country rich both in physical resources and creative talent. However, Sierra Leone is infamous for a decade-long rebel war in the '90s when entire villages were burnt down. An estimated 8,000 men, women and children had their arms and legs amputated during this time.'

3c Work in pairs. Read the beginning of the talk to your partner. What differences do you notice in your stress, rhythm or intonation?



7.1 The sore problem of prosthetic limbs

TED TALKS

1 ▶ 7.1 Watch the edited version of the TED Talk. Choose the correct option to complete the sentences.

- 1 David Sengeh was a *young man* / *boy* during the war.
- 2 Many people who had suffered amputation *didn't wear* / *couldn't afford* prosthetic limbs.

- 3 The prosthetic limbs available in Sierra Leone were *comfortable* / *painful* to wear.
- 4 While he was *still at school* / *doing his PhD.*, David Sengeh developed a solution to the prosthetic problem.
- 5 The sockets David Sengeh makes are *cheap* / *expensive* to produce.
- 6 David Sengeh wants to make functional prostheses for use in *Sierra Leone* / *anywhere*.

- 2 ▶ 7.1 Complete the sentences with five of these words or expressions. Then watch the first part (0.00–2.20) of the talk again and check your answers.

acceptable	as a result of	before
easy to find	find	fit
make	promised himself	

- 1 About 8,000 men, women and children were amputees _____ the war.
- 2 David Sengeh _____ that he would contribute to a better future for his country.
- 3 The main problem with prosthetic limbs was that they didn't _____ properly.
- 4 It can take years for an amputee to _____ a prosthesis that is comfortable.
- 5 David Sengeh thought that conventional, uncomfortable prosthetics were not _____ in today's world.

- 3 ▶ 7.1 Watch the second part (2.20–3.45) of the talk again. Put the events (a–e) in order.

- a He got very positive feedback from a recent trial.
- b They discussed solving the problem of painful sockets.
- c He produced the sockets with a 3D printer.
- d He met Professor Hugh Herr.
- e He used medical technology to look at individual patients.

- 4 ▶ 7.1 Watch the third part (3.45 to the end) of the talk again. Do you think these sentences represent David Sengeh's views?

- 1 His work should do more than simply help people to live a normal life.
- 2 Comfortable prostheses heal people psychologically as well as physically.
- 3 Good prosthetic limbs can transform people's lives.

- 5 Work in pairs. Discuss the questions.

- 1 In your country, do any of these technological innovations help people with disabilities in daily life?

wheelchair ramps
adapted public transport
audio as well as visual signals on street crossings
braille in lifts and on cash machines

- 2 What additional technologies or changes would make life better for disabled people in your community?

VOCABULARY IN CONTEXT

- 6 ▶ 7.2 Watch the clips from the TED Talk. Choose the correct meaning of the words.

- 7 Work in pairs. Complete the sentences in your own words.

- 1 One thing that troubles me is that ...
- 2 ... is simply unacceptable in our age.
- 3 I don't know how ..., but I'd love to figure it out.

CRITICAL THINKING Asking significant questions

- 8 When presenting a solution to a problem, it's important that your audience identifies the problem as a real one. Read this comment* about the TED Talk. What was 'the right question' (a–c) that David Sengeh asked?
- a Who can provide amputees with prosthetic limbs?
 - b What can amputees do to improve their lives?
 - c Why do amputees choose not to wear their prostheses?

Viewers' comments

- Kurt – What I admire in David is that not only did he solve the problem, he asked the right question in the first place.

*The comment was created for this activity.

- 9 Work in pairs. Why was David Sengeh's question 'the right question'? What did it lead to?

PRESENTATION SKILLS Taking the audience on a journey

In a talk, you take your audience on a journey.

- Know where you want to take them: make sure your talk has a beginning, a middle and an end.
- Check that your talk structure is clear. Think of the sub-title you could give each section. If this is hard for you, you're not ready to give your talk.

- 10 Look at the Presentation tips box. Then identify these parts of David Sengeh's talk as the beginning (B), middle (M) and end (E).

- explaining the problem
- implementing a solution
- describing the situation

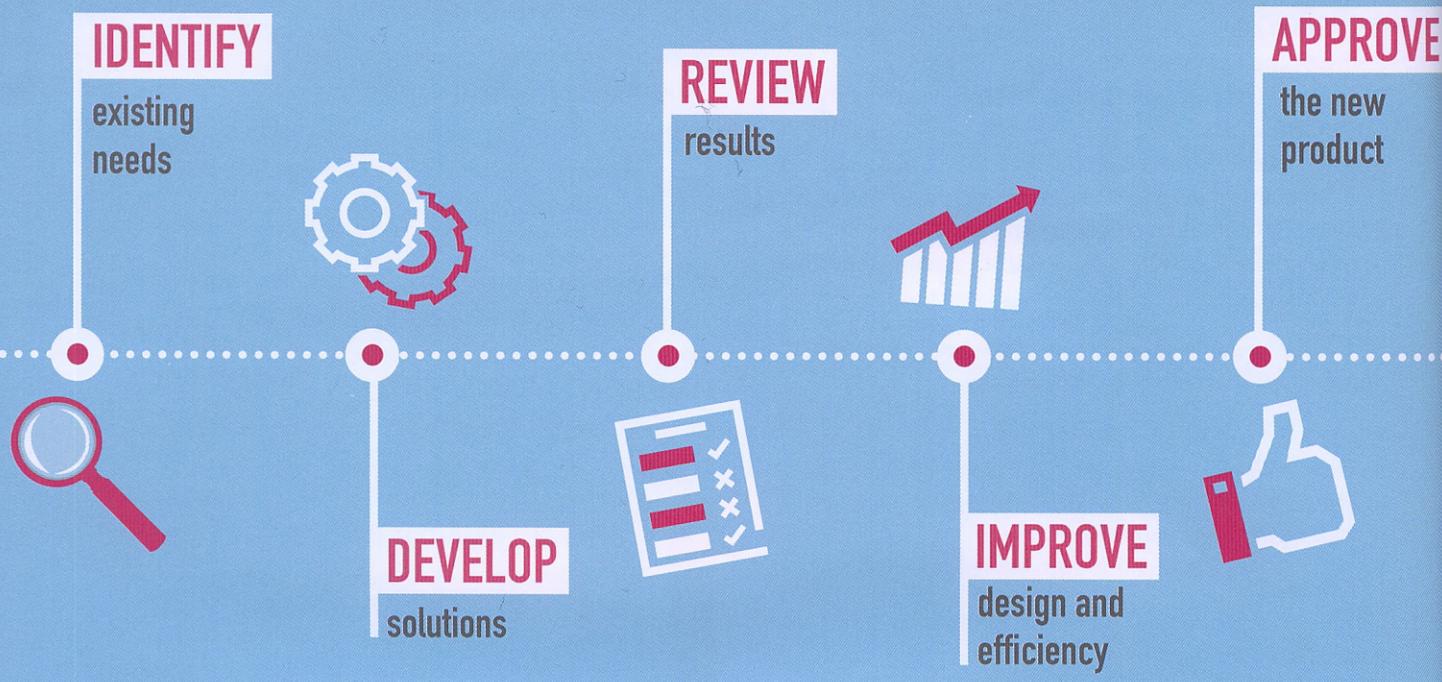
- 11 ▶ 7.3 Watch the clips (1–3) from the TED Talk. Match the clips with the three parts (B, M, E).

- 12 Work in pairs. You are going to give a presentation to explain how a problem was solved. Choose one of the innovations you discussed in Exercise 5. Structure your presentation to talk about the situation, the problem and the solution.

- 13 Work with a new partner. Give your presentation. Are the three parts of your presentation clear?

7.2 Developing new technology

RESEARCH AND DEVELOPMENT



GRAMMAR Passives

- 1 Work in pairs. Match the inventions with the dates of their development.

3D printer	1880s
computer mouse	1950s
driverless car	1960s
electric car	1970s
fibre optics	1980s
smartphone	1980s
solar cells	1990s
stem cell therapy	2000s

- 2 Look at the infographic showing the process of research and development. Do you think any of the inventions in Exercise 1 followed this process? Which ones?
- 3 Read the text in the Grammar box. Answer the questions (1–2).

PASSIVES

Fibre optics is a technology which allows information to be transmitted along a flexible, transparent fibre. The technology was initially researched in the mid-20th century. The term was made popular in 1960 following an article in Scientific American by Narinder Singh. By the 1970s, the first commercially successful optical fibre had been developed. Since then, many uses for fibre optics in telecommunications and medicine have been identified. New applications are being tested all the time and it's clear that fibre optics will be used in a wide range of contexts in the future.

- 1 Underline the passive forms of the verbs. Which verb is used with the past participle to form the passive?
- 2 Which information (a–d) does a passive sentence always give?
- who does the action
 - when it happens
 - why it happens
 - what happens

Check your answers on page 152 and do Exercises 1–6.

- 4 Complete the paragraph about nanotechnology with these passive verbs.

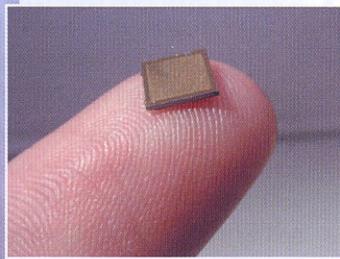
can't be seen	has been used
needs to be regulated	should be handled
will be disposed of	was inspired

Nanotechnology (*nano* means extremely small) is a relatively new technology which¹ **was inspired** by ideas that the physicist Richard Feynman had 50 years ago. The actual materials – nanomaterials – are so tiny that they² _____ with a standard microscope. They include materials such as carbon or silver. Recently nanotechnology³ _____ to improve products as diverse as sunscreen, solar cells and bandages. There are some worries about the long-term effects of nanomaterials and some scientists warn that they⁴ _____ very carefully or that their use⁵ _____ by governments. One problem is how products containing nanomaterials⁶ _____ or recycled in the future.

- 5 Read about a new way of giving medicines to people. Choose the correct form of the verbs, active or passive, to complete the article.



Nanopatches:
pain-free vaccinations



In medicine, many technological solutions¹ **have developed / have been developed** for specific problems. A good example of this is giving medicine to prevent diseases, such as flu, which² **cause / are caused by** infection. Most of these medicines³ **deliver / are delivered** by needle. But approximately twenty per cent of people are afraid of needles. This⁴ **can stop / can be stopped** them going to the doctor's. According to the WHO, half of the vaccines which⁵ **give / are given** in tropical areas don't work because they⁶ **haven't kept / haven't been kept** cold enough. Now a new way of giving these medicines to people – the nanopatch –⁷ **is testing / is being tested**. The nanopatch is a small patch that sticks to your skin. Mark Kendall and his team at the University of Queensland in Australia⁸ **have been working / have been worked** on the nanopatch for several years. He hopes that the nanopatch⁹ **will make / will be made** a big difference to the number of deaths (currently 17 million a year) from infectious diseases.

- 6 Read the article in Exercise 5 again and choose the preposition used to say:

- 1 why many technological applications have been developed *by / for*
- 2 how a lot of medicines are delivered *by / for*

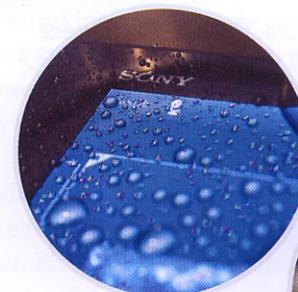
- 7 Complete the sentences with *by* and *for*.

- 1 Calculations that would take humans years can be done _____ computers in minutes.
- 2 The authorities say that the disease can't be spread _____ animals.
- 3 The medicine should be taken _____ mouth.
- 4 Samples have been taken _____ analysis and the results will be available tomorrow.
- 5 Following complaints, all the products are being checked _____ faults.
- 6 Better results would be achieved _____ repeating the trial with more people.

SPEAKING Technology in everyday life

8 21st CENTURY OUTCOMES

Work in small groups. Look at the list of inventions and discuss what you know about each one. Then decide what problem each one solves or what purpose it has. Choose the two inventions you think are most important.



- electric cars
- driverless cars
- 3D printers
- bionic limbs
- waterproof coatings
- biodegradable plastic
- solar panels
- smart materials (that react to changes in their environment)