

Science and Tech Sense

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by Andrew E. Bennett


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Introduction

In *Science and Tech Sense*, units are organized around a 400-word article on a topic, trend, or breakthrough in a scientific field. A range of fields are covered, including medicine, physics, astronomy, biology, engineering, and more. The articles, as well as the book's exercises, are set at an intermediate level. The reading passages are designed to be understandable and interesting to all students, regardless of their major. What's more, vocabulary and grammar levels are carefully maintained to maximize comprehension while gradually building language abilities.

1 Bioprinting



Millions of people need life-saving organs. They sometimes have to wait a long time for one to become available. Medical science may finally have a solution. 3D printers are being used to create real human tissue. Soon, machine-printed lungs and hearts may be commonplace.

● **Topic Warm-Up**
Consider these statements. Circle if you agree (A) or disagree (D).
1. Within 20 years, science will solve all of our medical problems. (A / D)
2. In the future, many people will have machine-made body parts. (A / D)

● **Vocabulary Warm-Up**
Complete each sentence with the correct word or phrase. Remember to use the correct word form.

application	promising	cure	one by one
device	multiply	a game changer	ambitious

1. We can _____ the disease with this medicine.
2. David is very _____. His goal is to become the director of the hospital.
3. Please place the bottles on the shelf _____. Be careful not to drop any.
4. The cells have _____. There were just a few at first. Now there are hundreds.
5. The cream's main _____ is treating dry skin. It can also be used for other skin problems.

1

Units open with a warm-up page. First there is a short introductory paragraph. This passage is designed to get students thinking about the topic so they can scaffold their own prior knowledge. Next is a warm-up exercise containing two statements which students can agree or disagree with. These statements, which are related to the unit's topic, can also be discussed in pairs, small groups, or together as a class. Finally on the first page, there is a vocabulary warm-up exercise checking students' knowledge of the unit's target vocabulary items.

There are eight target vocabulary items per unit. They were chosen for their frequency of use and suitability when talking or reading about the topic. These items may be single words or phrases such as common expressions, phrasal verbs, and colloquialisms.


The second and third pages of each unit contain an article which is roughly 400 words long. At the top of the article is a CD icon along with the audio recording's track number. To the left of each page, there are line numbers making it easier to refer to a specific section. Also, the unit's target vocabulary items are in bold. Finally, every article is followed by a glossary. Here, definitions of challenging words and phrases are given in simplified English.

Reading Passage Track 2

From making art to crafting eye glasses, 3D printers are reshaping our world. One of their most **promising** uses is in medicine. As the name suggests, "bioprinting" uses living cells to print human tissue. Its **applications** include testing drugs and treating injuries. Years from now, bioprinting may even **cure** people waiting for new hearts, livers, and other organs.

On a mechanical level, a bioprinter combines several technologies. It starts with a computer that supplies a model of the object being printed. As the bioprinter moves around, it acts like an inkjet printer, delivering cell droplets **one by one**. Since it is a 3D printer, the **device** can move up, down, and in other directions. Tissues slowly grow as they are printed one layer at a time.

The creation of a bioprinter's cell droplets, called "bioink," is fascinating. First, living cells are cultured in a laboratory, allowing them to **multiply**. Thousands of cells are gathered into a single droplet of bioink. During the printing process, one print head delivers the bioink. Another delivers "biopaper," a gel or other material that supports the growing tissue.



The first bioprinter was made in 2008 by Professor Makoto Nakamura. He used it to create "biotubing" that worked like a blood vessel. The following year, California-based Organovo built its NovoGen MMX Bioprinter. By 2014, the company was printing human liver tissue for use in drug testing. That's one of the technology's main applications. By working with material that acts like human tissue, drug companies can reduce animal testing. They can also speed up drug development schedules.

A more **ambitious** goal for the technology is the creation of body parts such as bones and organs. That's a challenging task. Printing something that behaves like a kidney is one thing. Making the organ stable and long lasting is another. But progress is being made. For example, Cornell University researchers are working on printing heart valves. And scientists at Harvard University have used silicon molds to make thicker, longer-lasting tissue.

Perhaps the greatest hope for bioprinting is in personalized medicine. One day, a patient's own cells may be used to create bioink to print a custom-made organ. The process would make it easier for his or her body to accept the replacement. Such an advance would be a **game changer**, saving millions of lives. With many researchers hard at work, bioprinting could soon become a key medical tool. It may even make organ waitlists a thing of the past.

Glossary
 tissue – group of cells that form organs and other body parts; droplet – small drop; fascinating – very interesting; cultured – grown; speed up – make faster; task – job; heart valve – part of the heart that opens and closes to let blood through; personalized – made for a specific person; a thing of the past – something that doesn't exist anymore

Comprehension Check
 Choose the best answer to each question.

Main Idea
 1. What is the main idea?
 (A) Many patients must wait a long time for organ transplants.
 (B) Drug companies are doing most of the research into bioprinting.
 (C) Bioprinters make human tissue for important medical uses.
 (D) Besides bioprinting, 3D printers are used for a variety of tasks.

Detail
 2. How is a bioprinter like a 3D printer?
 (A) It can move in many directions. (B) It only prints flat objects.
 (C) It prints things using black ink. (D) It sends images to a computer.

Analysis
 3. What does the article suggest about bioprinting organs?
 (A) We can already print every kind of organ for transplant use.
 (B) Patients' bodies will reject organs that are bioprinted.
 (C) Bioprinting organs is easier than bioprinting bones.
 (D) It is still hard to print organs that will last a long time.

Circle if each statement is true (T) or false (F).
 1. A droplet of bioink contains thousands of living cells. (T / F)
 2. Organovo created the NovoGen MMX Bioprinter in 2008. (T / F)

Following the article is a reading comprehension section. It starts with three multiple choice questions. They comprise a variety of question types which frequently appear on standardized tests such as TOEIC and TOEFL. Next, there are two true or false items.

The fourth page of each unit starts with a pair of vocabulary exercises. Between them, all eight of the unit's target vocabulary items are tested. The first exercise is a set of five multiple choice cloze sentences. For the second exercise, students choose the word or phrase that means the same as the underlined part.

Vocabulary Check

A. Choose the best word or phrase to complete each sentence.

- Over the years, the number of fish in the lake has _____.
 (A) combined (B) printed (C) multiplied (D) treated
- _____, the doctors entered the room. They were about to begin a difficult operation.
 (A) One by one (B) Years from now (C) Long lasting (D) A thing of the past
- The new drug is a(n) _____. It works for 90% of the patients that take it.
 (A) organ waitlist (B) mechanical level
 (C) printing process (D) game changer
- Linda is not very _____. She is happy cleaning the office building, and she doesn't want a better job there.
 (A) single (B) ambitious (C) delivered (D) stable
- There's a red light on the _____. It tells you when the machine is turned on.
 (A) device (B) technology (C) tissue (D) layer

B. Choose the word or phrase that means the same as the underlined part.

- The research hospital's technique for treating cancer patients is promising.
 (A) expensive (B) hopeful (C) unknown (D) different
- My dad says the best way to cure a cold is to get plenty of rest.
 (A) make better (B) spread around (C) look into (D) forget about
- Common medicines like aspirin have many applications.
 (A) prices (B) sizes (C) clinics (D) uses

Grammar Building - Adjective Clauses

Choose the correct word to complete each sentence.

Ex: A bioprinter is a machine (that / who) prints human tissue.
Ans: A bioprinter is a machine *that* prints human tissue.

- Professor Nakamura is a scientist (who / where) has made important findings.
- This is the laboratory (that / where) the cells are cultured.
- The hospital has dozens of patients (where / who) are waiting for new organs.
- Harvard researchers use silicon molds (that / who) help tissue last longer.
- Organovo is doing work (where / which) is famous in the bioprinting field.

Next, there is a grammar exercise. It is based on a language structure found in the reading passage. First, a sample item and its answer are given. Then, five items check students' understanding of the structure.

Next is a unique Technical Focus section. It starts with an illustration or diagram of something related to the unit. For example, Unit 1 contains a drawing of a 3D printer. Unit 3 shows a spacecraft's approach and departure from an asteroid. In books, journals, and websites, science and technology articles frequently contain visual aids. The drawings and annotations in *Science and Tech Sense* are designed to be understandable to all students, regardless of their field of specialty. The goal is to give students more exposure to visual aids, enriching their study of the topic while expanding their English skill set.

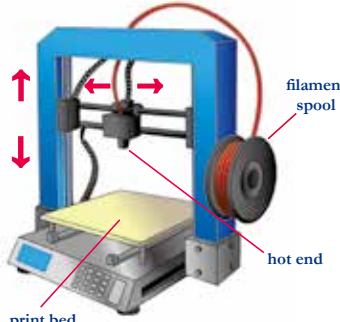
The fifth page starts with an exercise that combines the unit's target grammar structure and target vocabulary items. Students arrange a series of words and phrases into the correct sentence order. The answers should be written on the lines provided.

Grammar + Vocabulary
Put the words in the correct sentence order.

- (who wants to / researcher / cure cancer / an ambitious / He is).

- (air pressure / a device / measures / A barometer / which / is).

Technical Focus



A. Look at the illustration of a 3D printer. Then, circle if each statement is true (T) or false (F).

- A wire is wound around the filament spool. (T / F)
- The print bed is at the very top of the machine. (T / F)
- Some parts of the printer move up and down or left and right. (T / F)

B. Fill in the blanks with the correct word(s) from the box.

positions	which	finish
one of	with	challenges

For a 3D bioprinter, the accurate positioning of the print heads is very important. It's 1) _____ the key engineering 2) _____ of designing a bioprinter. To create the NovoGen MMX Bioprinter, Organovo partnered 3) _____ Invetech. It only took the company, 4) _____ is in the same city as Organovo, nine months to 5) _____ the task. Invetech did an amazing job. A computer-controlled laser 6) _____ the print heads with great accuracy.

5

Accompanying each illustration or diagram are three true or false statements. They are followed by a cloze paragraph which provides more details about the item under focus. A box containing six words or phrases is given. The paragraph beneath the box has six blanks, and each item from the box should be used only once.

The final page of each unit starts with a word parts exercise. It presents three word parts which are found in the reading passage. There is one prefix, one root, and one suffix. The meaning for each of them is given. Also, three example words are provided. The first example is the word from the reading passage that the prefix, root, or suffix is based on.

Word Parts
Study the word parts in the chart. Then, read the following pairs of sentences. Circle if the second sentence is true (T) or false (F).

Word Part	Meaning	Examples
re-	again	reshape, revise, reconsider
-bio-	life	bioprinting, symbiotic, bionic
-ory	related to a place	laboratory, observatory, conservatory

- The lab technicians are redoing the test to verify the results.
It's their first time trying the test. (T / F)
- The biographer spent years learning about Marie Curie.
The biographer researched Curie's life. (T / F)
- We can check the contents of the book depository online.
The depository is the person who organizes the books. (T / F)
- Earth's biosphere goes from deep underground to high above the planet.
Life is found below, on, and above the planet. (T / F)
- My supervisor said we should redesign the neck brace.
The neck brace needs to be designed one more time. (T / F)

Discussion
Discuss these questions with your classmates.

- In your opinion, what are the most promising uses of bioprinters?
- What are some medical challenges that could soon be solved by science?

6

Finally, there is a discussion exercise with two questions about the topic. This is an opportunity for students to use the language tools (such as the target vocabulary items) learned in the unit. It's also a chance for students to provide their own perspectives and opinions.

Next is an exercise containing three items that check students' understanding of the word parts. After reading the first statement, students should read the second one and circle if it is true or false.

Contents

As one possible classroom activity, if the discussion exercise is done in pairs or in small groups, one student can take notes, and after a few minutes, the pairs or groups can share their results with the whole class. Or the class might prefer to answer the questions together. The exercise can even be turned into a short writing assignment, with students asked to use some of the unit's target vocabulary items and/or the target grammar structure while answering one of the questions.

Thank you very much for choosing *Science and Tech Sense*. I hope it broadens your students' perspectives while helping make your classes more engaging and successful!

Andrew E. Bennett

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1 Bioprinting



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● Topic Warm-Up

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Complete each sentence with the correct word or phrase. Remember to use the correct word form.

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A more **ambitious** goal for the technology is the creation of body parts such as bones and organs. That’s a challenging task. Printing something that behaves like a kidney is one thing. Making the organ stable and long lasting is another. But progress is being made. For example, Cornell University researchers are working on printing heart valves. And scientists at Harvard University have used silicon molds to make thicker, longer-lasting tissue.

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Glossary

tissue – group of cells that form organs and other body parts; **droplet** – small drop; **fascinating** – very interesting; **cultured** – grown; **speed up** – make faster; **task** – job; **heart valve** – part of the heart that opens and closes to let blood through; **personalized** – made for a specific person; **a thing of the past** – something that doesn’t exist anymore

● **Comprehension Check**

Choose the best answer to each question.

Main Idea

1. What is the main idea?
 - (A) Many patients must wait a long time for organ transplants.
 - (B) Drug companies are doing most of the research into bioprinting.
 - (C) Bioprinters make human tissue for important medical uses.
 - (D) Besides bioprinting, 3D printers are used for a variety of tasks.

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Circle if each statement is true (T) or false (F).

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2. Organovo created the NovoGen MMX Bioprinter in 2008. (T / F)

● **Vocabulary Check**

A. Choose the best word or phrase to complete each sentence.

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B. Choose the word or phrase that means the same as the underlined part.

- The research hospital's technique for treating cancer patients is promising.
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- Common medicines like aspirin have many applications.
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● **Grammar Building - Adjective Clauses**

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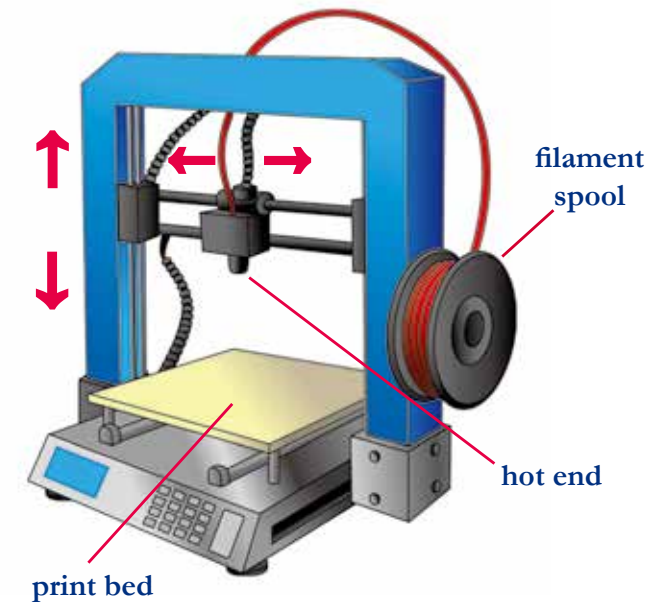
● **Grammar + Vocabulary**

Put the words in the correct sentence order.

1. (who wants to / researcher / cure cancer / an ambitious / He is).

2. (air pressure / a device / measures / A barometer / which / is).

● **Technical Focus**



A. Look at the illustration of a 3D printer. Then, circle if each statement is true (T) or false (F).

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positions	which	finish
one of	with	challenges

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It's their first time trying the test. (T / F)
- The biographer spent years learning about Marie Curie.
The biographer researched Curie's life. (T / F)
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The depository is the person who organizes the books. (T / F)
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- What are some medical challenges that could soon be solved by science?



Cars are a central feature of modern life. However, along with them come accidents, air pollution, and other problems. The world's leading car and technology companies are working on cars that drive themselves. These 21st century vehicles will make roads cleaner and safer.

Topic Warm-Up

Consider these statements. Circle if you agree (A) or disagree (D).

- In the future, I want to own a car. (A / D)
- Cars that are completely controlled by computers will be safe. (A / D)

Vocabulary Warm-Up

Complete each sentence with the correct word or phrase. Remember to use the correct word form.

category	real estate	potential	rate
efficient	drawback	analyze	overhaul

- Unfortunately, the building project will be expensive. That's its biggest _____.
- We need to _____ this data. Our job is to understand why traffic is bad downtown.
- It's a really _____ machine. It scans 1,000 pages in five minutes.
- The city is growing at a fast _____. Since 1990, it has doubled in size.
- Cars in the "all-electric" _____ are clean, and they create very little pollution.