SPEAK YOUR MIND

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For more information, please go to:
www.macmillanenglish.com/speak-your-mind

Please see inside the front cover for the minimum system requirements and other terms and conditions for the digital components of the course.
WHAT DO YOU ALREADY KNOW?
1 IN GROUPS Think about these areas of research. Are they all equally important?
   • finding a cure for cancer
   • studying distant galaxies
   • researching the effects of climate change

THINK AND PREPARE
2 Do you agree or disagree with this statement?
   Scientists should solve real-world problems and not just do pure research.
3 IN PAIRS Prepare a panel discussion where you will present your ideas. You are members of a college panel discussing how to use this year’s research budget. You are choosing between two projects to fund. Some of you support one project and some of you support the other. The two projects are:
   • a search for exoplanets, outside our solar system
   • research into the effects of traffic pollution on children
   Consider these points:
   • the cost of the project
   • the possible short-term benefits of the project
   • the possible long-term benefits of the project

SPEAK YOUR MIND
4 Hold your panel discussion for the class.

In this unit, you will …
• brainstorm the qualities of a successful student and discuss academic honesty.
• focus on Mediation: simplify information for different levels of fluency.
• focus on a Thinking Skill: interpreting.
• read about the ethics of scientific research.
• learn about openness and how open you are to new experiences.
• read about analytical thinking and the professions that use this skill.

VIDEO
Watch the video as you prepare for the panel discussion, and find out how to best use your voice.
LESSON 1 HARD WORK OR LUCK?

LIFE SKILLS openness

A Read the definition of openness. In what ways is openness important to you in your personal, academic, and professional life?

Openness is the ability to accept new ideas or methods. People who have a high level of openness are imaginative and curious. They find new ways to solve problems, and they are often described as able to "think outside the box." This is an advantage when they are involved in research and innovation.

B Check (√) the statements you agree with. Then compare with a partner.

- Science is about hard work and careful planning.
- You need good luck to be successful in science.
- A scientist has to have an open mind.
- Scientists always know what to expect from their experiments.

C 6.01 Read the article and answer the questions.

Chance Discoveries

People who don’t work in scientific fields may think that all scientists follow the scientific method when they do research. When scientists want the answer to a question, they usually form a hypothesis and design an experiment to test the hypothesis. Then they carry out the experiment and reach a conclusion. If the hypothesis isn’t absolutely correct, the scientists form a new hypothesis and the process continues.

However, the scientific method doesn’t include an important factor: luck.

Luck has played a large part in some of the most important scientific discoveries. For instance, luck played an important role when Sir Alexander Fleming discovered the first antibiotic, penicillin, in 1928. Fleming was studying bacteria when he noticed something highly unusual. A dish that had been left near a window had green mold growing on it. The mold seemed to kill the bacteria, which was a totally unexpected result. Fleming and his assistants did further tests and found that the mold produced a chemical, now known as penicillin, which killed the bacteria.

The discovery of X-rays and radioactivity also involved luck. In 1895, Wilhelm Röntgen was using a piece of equipment called a cathode ray tube. When Röntgen filled the tube with a special gas and connected it to an electric current, the tube produced ultraviolet radiation. The radiation made a screen covered with a barium (Ba) compound glow. By chance, Röntgen placed heavy paper between the tube and the screen, and the screen continued to glow. Röntgen discovered that X-rays (as he called them) went through objects!

A year after Röntgen’s discovery, French physicist Henri Becquerel was studying X-rays using a chemical containing uranium (U). He thought sunlight made the chemical produce X-rays. He covered some photographic plates with black paper, put the chemicals on top, and left them in the sun. The image of the uranium crystals was on the plate. He thought his hypothesis was absolutely right. One day it was cloudy, so Becquerel didn’t do any experiments. He put his chemicals and photographic plates in a drawer. By chance, he developed the photographs from the drawer, even though it was high chance he would find an image. To his surprise, he saw the image of the crystals. He had discovered that the chemicals, not the sunlight, caused radioactivity. His hypothesis had been completely wrong.

Today, penicillin, X-rays, and radioactive chemicals are used in medicine around the world. The world would be a very different place if we didn’t have them. Fleming, Röntgen, and Becquerel were all lucky, but they were also prepared. If they hadn’t spent years in their laboratories, they wouldn’t have had the expertise they needed to use their luck. In addition, they were curious and open-minded. As a result, they discovered things that other scientists had not noticed. Some people argue that highly successful people use these same skills in life, not just in science. If you have the right expertise and the right attitude, you will be able to make the most of your luck.

D IN PAIRS Read the situations below. What is the opportunity in each situation? Discuss what might happen if you were open to taking the opportunity.

1. You are at a party. You overhear someone talking about her studies. She is studying the same subject you are and looking for someone to join her research group.
2. You are at work. You hear that the company is looking for people to work in its new office in another city.

E Discuss the questions as a class.

1. On a scale of 1 (not very open) to 10 (very open), how open are you to new experiences?
2. Do you want to be more open to new experiences? If so, what can you do?
3. How might being open to new opportunities help you in your present or future career?

VOCABULARY adverb + adjective collocations

A Look at the article from LIFE SKILLS C. What part of speech is totally? What part of speech is unexpectedly?

B IN PAIRS Use the adverbs absolutely, completely, highly, and totally with the adjectives in the box. Make as many adverb + adjective pairs as you can.

<table>
<thead>
<tr>
<th>absolutely correct</th>
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<tbody>
<tr>
<td>correct different</td>
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</tr>
<tr>
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<td>unlikely</td>
<td>unusual</td>
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C Ask and answer.

1. Would you be completely happy to work in science? Or would you prefer to do something completely different?
2. What qualities do you need to be a highly successful scientist?

GRAMMAR conditionals review

A Match the excerpts from the article (1–4) to the meaning of each conditional sentence (a–d).

1. If you have the right expertise and the right attitude, you will make the most of your luck.
   a. a general truth
   b. a future possibility
   c. a hypothetical present
   d. a hypothetical past

2. If the hypothesis isn’t absolutely correct, the scientists form a new hypothesis and the process continues.

3. If they hadn’t spent years in their laboratories, they wouldn’t have had the expertise they needed to use their luck.

4. The world would be a very different place if we didn’t have them.

B IN PAIRS Read the situations below. What is the opportunity in each situation? Discuss what might happen if you were open to taking the opportunity.

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<th>Sentence</th>
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<td>Real conditions:</td>
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<td>simple present</td>
</tr>
<tr>
<td>Zero conditional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real conditions:</td>
<td>If you carry out this experiment, you will see some interesting results.</td>
<td>present tense</td>
</tr>
<tr>
<td>First conditional</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>If I were a scientist, I would like to work in a research lab.</td>
<td>past participle</td>
</tr>
<tr>
<td>Second conditional</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>If I had been in Alexander Fleming’s position, I would not have noticed the same thing he did.</td>
<td>past participle</td>
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<td>Third conditional</td>
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B IN GROUPS Discuss these statements. Decide as a group whether you Agree, Disagree, or are Not sure.

1. You have to have the right attitude to be successful. **Agree / Not sure / Disagree**
2. Successful people focus on being good at just one thing. **Agree / Not sure / Disagree**
3. Most successful people have been lucky in their lives. **Agree / Not sure / Disagree**

C Complete the table with the correct tenses.

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D Say if you agree or disagree with each of the sentences you wrote in C.

**PRONUNCIATION** intonation in conditionals

A 6.02 Listen to this sentence. Choose the correct intonation.

1. If I were a scientist, I’d research climate change. **True**
2. If I were a scientist, I’d research climate change. **False**

B 6.03 Practice saying these sentences with the correct intonation. Listen and check.

1. If you train as a scientist, you learn to expect the unexpected. **True**
2. If you work hard, you’ll pass your anatomy exam. **True**

**SPELLING**

A What do you think leads to academic success? Look at the ideas in the box and write your ideas in your notebook. Then compare with a partner.

- ability to handle stress
- curiosity
- hard work
- an open mind
- family support
- luck

B IN GROUPS Discuss these statements. Decide as a group whether you Agree, Disagree, or are Not sure.

1. You have to have the right attitude to be successful. **Agree / Not sure / Disagree**
2. Successful people focus on being good at just one thing. **Agree / Not sure / Disagree**
3. Most successful people have been lucky in their lives. **Agree / Not sure / Disagree**

C Share your answers with the class. Explain the reasons for your choices.
According to Nathan, ...
1. parents should be allowed to choose their children’s characteristics.   True / False
2. regular citizens should decide on ethical rules for scientists.   True / False
3. scientists should be left to make decisions.   True / False

According to Hannah, ...
4. there should be no ethical rules controlling scientists.   True / False
5. some useful research is prevented because of ethical rules.   True / False
6. organ transplants and genetically modified plants are positive research developments.   True / False

READING SKILL—Identify reasons. Complete the sentences with each person’s reasons for his or her opinion.

Nathan
1. We need clear, ethical rules because
2. We can’t trust scientists to make ethical decisions because
3. There is a misunderstanding of genetics because of
4. We have organ transplants and genetically modified plants now because scientists

Hannah
5. According to Hannah, …
6. There is a misunderstanding of genetics because of
7. We have organ transplants and genetically modified plants now because scientists
8. According to Nathan, …
9. We can’t trust scientists to make ethical decisions because
10. There is a misunderstanding of genetics because of

VOCABULARY—science word formation

A. Complete the table with the correct words. Check in a dictionary if needed.

<table>
<thead>
<tr>
<th>Noun (thing)</th>
<th>Noun (person)</th>
<th>Verb</th>
<th>Adjective</th>
<th>Adverb</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. beneficiary</td>
<td>benefit</td>
<td>2.</td>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4. discover **</td>
<td>**</td>
<td>curious</td>
<td>5.</td>
<td></td>
</tr>
<tr>
<td>6. develop</td>
<td>7.</td>
<td>8.</td>
<td>9.</td>
<td></td>
</tr>
<tr>
<td>10. discover</td>
<td>**</td>
<td>discoverable</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>15. medicine</td>
<td>**</td>
<td>16.</td>
<td>17.</td>
<td></td>
</tr>
<tr>
<td>18. science</td>
<td>**</td>
<td>19.</td>
<td>20.</td>
<td></td>
</tr>
</tbody>
</table>

GRAMMAR—conditional conjunctions and phrases

A. Underline sentences in READING B with these conditional conjunctions and phrases.

- as long as
- once
- since
- in case
- provided that
- unless

B. Match each conditional conjunction to the correct meaning. You will use one meaning twice.

1. as long as
2. in case
3. once
4. provided that
5. since
6. unless

- a. because it is possible that
- b. except if
- c. at the moment something happens
- d. only if
- e. because it is true that

WRITING—a for/against essay

A. Put the paragraphs in the correct order. Then match each paragraph to the correct essay parts below.

Should smallpox be destroyed?

= a. On the other hand, people of the opposite opinion argue that we need to study the smallpox virus to protect ourselves against other diseases. By studying the smallpox virus, we learn more about how vaccines work and how viruses respond to those vaccines. Since viruses change all the time, we never know when a new serious disease may appear. Our research on the smallpox virus helps to protect us against possible future epidemics.

= b. In general, I tend to find the arguments against destroying the smallpox virus more convincing. The risk of the virus escaping is very small, and the research may be very important in the future. I do not believe that the smallpox virus should be destroyed.

= c. Smallpox, which used to kill millions of people every year, has been eradicated in the wild. It survives in small amounts in two laboratories and is used for research purposes. Some people argue that the remaining samples of smallpox should be destroyed.

= d. The main argument supporting this opinion is the claim that the virus is still a danger to humanity. There are two main fears. First, the virus could escape from the laboratory. This could be the result of a careless researcher, for example, or an accident such as an explosion. Second, the virus could be deliberately released or used as a weapon. In both cases, millions of people would die. The benefits of studying the virus are not worth the risk, some argue.

B. Do you agree with the writer? Discuss as a class.

C. Choose an essay question below. Write a four-paragraph for/against essay in your notebook. Use the essay in A as a model.

- Should people be allowed to choose their child’s characteristics?
- Should other animals have the same rights as humans?
- Should society control the human population?

SPEAKING

A. Read the situation and possible courses of action. Check (✓) the courses of action you think would be acceptable in this situation.

You are in the college dining hall when you overhear a conversation at another table. Two students from one of your classes are talking about an important test that is coming up. As you continue to listen, you realize that they are planning to break into your professor’s office to get the answers to the test. It seems they are planning to do that the following night.

Possible courses of action:
- □ warn the students that you heard their plan
- □ tell your professor about the plan
- □ tell your classmates about the plan
- □ ask the students to share the answers with you
- □ do nothing

B. IN PAIRS Tell each other about the course of action you have chosen. Say what you think the consequences of each action might be.
LESSON 3  MAGNETISM

A Match the words to the definitions.

1 A magnet is __________
2 A compass is __________
3 A wire is __________
4 A hammer is __________
5 Iron is __________
6 Steel is __________
7 An electric current is __________
8 An atom is __________

VOCABULARY magnetism

1 magnet
2 compass
3 wire
4 hammer
5 iron
6 steel
7 electric current
8 atom

A IN PAIRS Discuss ways we use magnets in everyday life.

B 6.05 LISTENING SKILL—Identify key information Listen to a lecture about magnetism. Complete the notes with words and phrases.

LISTENING

1 Magnet materials: 1__________ especially 2__________ or steel
2 3 ways magnets are made:
3 by 3__________ e.g., use a hammer to hit a steel bar
4 must face 4__________ in line with Earth’s 5__________ pole
5 works because you line up the 6__________
6 use another 7__________ need to move magnet along the 8__________ in one direction
7 use an 9__________ current
8 metals—magnetized because of their atomic structure
9 electrons can move in metals, not in 10__________ or 11__________

THINKING SKILL interpreting

A This graph shows the percentage of female college graduates in selected subject areas. Look at the graph and answer the questions below.

1 Which country has the highest percentage of female graduates in Science and Technology? Which country has the lowest percentage?
2 How does the percentage of female graduates for Social Sciences, Business, and Law compare to the percentage for Engineering, Manufacturing, and Construction in South Africa?
3 How do the percentages of female graduates for Education compare to the percentages for Science and Technology in all countries?
4 What statements are true for all countries?

B IN PAIRS Discuss how the percentage of female graduates in science and technology might be increased. Talk about how effective each of these suggestions would be and add your own ideas.

• teach about famous female scientists and engineers in high school
• avoid stereotyping men and women in specific careers when speaking with children
• teach what is involved in different scientists’ roles
• show the social benefits of different scientific work
• invite female scientists to speak to high school students

C Share your discussion with the class.

Figure 1: Percentage of female graduates from tertiary degrees in selected subjects (2014)

USA Chile South Africa Turkey Indonesia India

Education Social Sciences and Business Engineering, Manufacturing and Construction Science and Technology

Go online and find out about other uses of magnetism. Then tell your classmates what you learned.
MEDIATION
CONFIDENT COMMUNICATOR simplifying information

A. Read the text and the conversation. Who makes the information in the text easier to understand? How does he or she do that?

Make Your Own Compass

To conduct the experiment, a needle and a magnet are required, along with a glass of water. In addition, a small piece of tissue paper is required. The needle is magnetized by rubbing the magnet along its length in one direction a number of times. The tissue paper is placed on the surface of the water and the needle is then placed on the tissue paper. When the tissue paper is pushed under the surface of the water, the needle continues to float due to surface tension. Since it is magnetized and free to float, the needle acts as a compass and lines up with the Earth's magnetic field. Note that the needle now points toward north.

Victoria: So, we’re going to do this experiment. I have the instructions here, but it’s a little complicated.
Chris: Yes, I know. It’s not easy to understand.
Emily: Let’s break it down into simple steps. First of all, we need a glass of water, a needle, a magnet, and some tissue paper. I have those things here.
Victoria: Good. What’s the next step? I don’t get what we have to do.
Emily: We need to magnetize the needle. In other words, we make it into a magnet. We do that by touching it with the magnet. Move the magnet in one direction. Do you understand?
Chris: Yes, I see. OK, I’ve done that. What’s next?
Emily: Put the tissue paper on the water. Then put the needle on the tissue paper.
Chris: It’s floating. Then the text says something about pushing it. I don’t get that.
Emily: Use your finger to put the tissue paper under the water so it goes down. Now the needle is on the water.
Victoria: Is that it? I’m not sure what I’m learning from that.
Emily: The needle is a compass. This way is north.
Victoria: Oh, I see! We’ve made a compass. That’s cool!

B. Read these tips on simplifying information. When might you need to simplify information for someone?

- Break the information down into smaller pieces. When you are simplifying instructions, break large steps down into smaller steps.
- Use clear language. Express the information in a simpler way, for example, by using the active voice instead of the passive voice or by using simple vocabulary.
- Check understanding. Make sure the other person understands before you move on to the next point or step.

C. IN GROUPS: Read the instructions for another experiment. Role-play a conversation like the one in A. Take turns simplifying the information.

Make an Electromagnet

A nail, or any other similar object with a high iron content, is required, as is a length of copper wire. A power source, such as a battery, is needed. The wire is coiled around the nail a number of times. The more times the wire is coiled around the nail, the higher the strength of the electromagnet. The ends of the wire are then attached to the opposite ends of the battery. Testing the electromagnet can be done using small steel objects, such as paper clips. In addition to strengthening the electromagnetic force by increasing the number of turns in the wire, increased strength can also be achieved by using a stronger battery.

D. Discuss these questions.
1. What steps from B did you use to simplify the information? Give examples.
2. What do you need to be careful of when you simplify information?
ANALYTICAL THINKING

We all need to solve problems and make decisions in our professional lives. Analytical thinking is the ability to approach a problem or a decision logically and systematically. When you use analytical thinking, you identify which features of a problem or a decision are important. This may involve slowly and methodically identifying a number of possible causes of a problem, including ones that are not immediately obvious. If you are facing a decision, it may mean carefully judging the rules and benefits of different options. These processes help you break a complicated situation down into smaller parts. When you break a problem or decision down like that, it allows you to consider each part in detail. You can then compare different options or solutions systematically, perhaps by listing the pros and cons of each one. It also means you can recognize any problems in the information you have available to you. For example, two pieces of information you have about a problem may be inconsistent. Analytical thinking helps you to identify which information is likely to be accurate so that you can work toward a solution.

Analytical thinking plays an important role in a large number of different professions. Scientists in all fields use this kind of thinking regularly. For example, a team of scientists may get unexpected results from an experiment. They would probably start by checking for the most obvious immediate causes first, such as human error. After they confirm that the problem was not caused by someone making a mistake, they would then go on to consider the design of the experiment and any other secondary factors that may be relevant. Eventually, they will identify the cause of the problem and come up with a solution. This kind of thinking is also important in business. When a manager identifies a problem in his or her organization, such as a drop in sales or an increase in costs, analytical thinking is used to identify the cause, such as a need for staff training. This kind of thinking is also important in business. When a manager identifies a problem in his or her organization, such as a drop in sales or an increase in costs, analytical thinking is used to identify the cause, such as a need for staff training.

Analytical thinking is important because a large part of professional life involves solving problems and making decisions. Good analytical thinking skills will make you more effective in your working life.

When you use analytical thinking, you …
1. consider the different parts of a problem at random. True / False
2. decide what is relevant to a problem or decision. True / False
3. solve problems quickly. True / False
4. consider small parts of a bigger problem or decision. True / False
5. can see when there are problems with the information available. True / False
6. find a solution when things don’t work out as you expected. True / False
7. compare possible causes and solutions with each other. True / False
8. use a skill that is helpful in a variety of professions. True / False

IN PAIRS Discuss the questions.

1. When you have a problem, is your first response to think analytically, or do you react in other ways?
2. Can you think of a time when you used analytical thinking? Explain what happened.
3. Are there any times when analytical thinking may not be appropriate?

IN GROUPS Read the situation and answer the questions.

You work in a laboratory which develops experimental chemicals. You are carrying out an experiment with plants. The experiment involves giving some plants a chemical that should make them grow taller and stronger. However, some of the plants receiving the treatment are not growing in the way you expect. Some of them are very short, while others don’t seem to be growing at all. There is also a set of control plants which has not received the chemical and the control plants have the same problem of not growing enough or at all. Before you talk to your supervisor, you would like to analyze the situation and discover the cause of the problem.

1. Which of the questions below would you ask to determine any immediate cause? Label the questions with the number 1.
   - Are the plants healthy or are there signs of disease?
   - Have the plants been watered correctly?
   - Have the plants received the correct amount of the chemical?
   - Has anything in the laboratory affected the plants?
   - Have the plants received the correct amount of light?
   - Is the laboratory too cold or too hot?
   - Are there other people with access to the plants?

2. Which of the questions below would you ask to determine other secondary causes? Label the questions with the number 2.
   - Are the plants healthy or are there signs of disease?
   - Have the plants been watered correctly?
   - Have the plants received the correct amount of the chemical?
   - Has anything in the laboratory affected the plants?
   - Have the plants received the correct amount of light?
   - Is the laboratory too cold or too hot?
   - Are there other people with access to the plants?

3. What other questions could you ask to analyze the experiment results?

4. How did you identify the key elements of the situation?

IN GROUPS Answer the questions.

1. What is the definition of “analytical thinking”?
2. What types of careers require analytical thinking?
3. What are some examples of how analytical thinking is used in the workplace?
4. Why is analytical thinking important in these jobs?
5. What are the qualities of an analytical thinker?
6. What can you do to improve your analytical thinking skills?

VIDEO WATCH THE VIDEO AND LEARN ABOUT ANALYTICAL THINKING