

SECTION A

Getting Started

TECHNOLOGICAL INVENTIONS

A.1. Which of the following technological inventions do you consider the most important? Why?

2. Which two do you think are the most expensive? And the cheapest?

Car	Internet	Fax machine	Vacuum cleaner
Computer	Mobile phone	Microwave	Telephone
Television	Dishwasher	Toaster	Fridge
Satellite dish	Solar panels	X-ray machines	Radio

Don't forget that you are not supposed to write in this space.

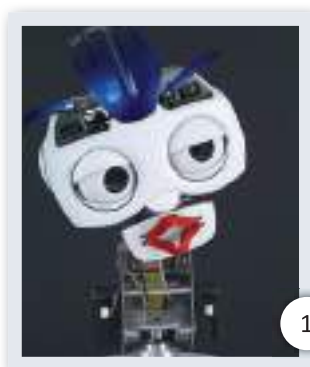
Copy the exercise into your notebook and do it there.



B. Vocabulary work on technology. Match the words on the left with their meaning on the right.

- | | |
|---------------|---|
| 1. device | a. a piece of equipment for domestic chores, such as a fridge or washing machine. |
| 2. appliance | b. a robot resembling a human being |
| 3. microchip | c. a mechanical or electrical invention; a gadget |
| 4. android | d. a tool that can maintain a desired temperature automatically |
| 5. thermostat | e. a very small silicon board with many electrical circuits |

C. Look at the pictures. Can you guess what these new inventions are for?



Focus on Reading

A. Read the texts about four very recent inventions to improve people's lives and match the pictures to the texts on the previous page to the texts below.

Now choose the correct heading for each text:

- | | |
|-------------------------------|---------------------|
| a) The English-Teaching Robot | b) The Electric Eye |
| c) Smart Thermostat | d) Cool Cat |

Text 1

The notion of robot as home companion is nothing new, but iCat adds a human dimension to the job: an expressive face. Tell her to go away, and iCat will look sad. iCat is multilingual — and 13 electric motors move her eyes, eyebrows*, eyelids*, mouth and head to produce the appropriate emotional response. iCat can also connect to the Net and display* online information on your TV or read it aloud.

* eyebrows=sobancelhas

* eyelids=pálpebras

* display = mostrar

Text 2

The EnergyHub is a device that lets you know exactly how much electricity (or gas) you're using in your home and how much it's costing you. It also turns appliances on or off and raises* or lowers* temperatures around your house depending on use.

* raise=augmentar

* lower = baixar

Text 3

This is a microchip that will enable* a blind person to recognise faces and navigate a room without assistance, helping the blind to regain* partial vision. Users are required to wear special glasses fitted with* a small camera that transmits images to the chip.

* enable = permitir

* regain = voltar a ter

* fitted with = equipados com

Text 4

South Korea, which employs some 30,000 foreigners to teach English, has plans for a new addition to its language classrooms: the English-speaking robot. Students in a few schools have already started learning English from the robot-teachers. The brightly coloured androids are part of an effort to keep South Korean students competitive in English.

adapted from: Top 10 Tech Inventions Shaping 2010



Don't forget that you are not supposed to write in this space.

Copy the exercise into your notebook and do it there.



1. Which of these new inventions

- can carry out different tasks?
- helps to save energy?
- can provide information?
- allows people to see?
- represents a threat to some professionals?
- is designed to help people cope with loneliness?
- allows internet links?

2. Complete these sentences in any suitable way.

- a. _____ interacts emotionally with its owner.
- b. This new gadget can control _____ use.
- c. _____ people a chance to regain partial eyesight.
- d. Robot teachers are used _____ students.

3. Text 4 is about a robot teacher. In pairs, make a list of the advantages and disadvantages of having a robot teacher. Here are some ideas and examples.

Advantages	Disadvantages
<i>Idea: nervous</i> <i>Example: Students may feel less nervous talking to robots than to a real person.</i>	<i>Idea: unfeeling machines</i> <i>Example: Artificial teachers are unfeeling machines and can't understand students' emotions.</i>
<i>Idea: cheap</i>	<i>Idea: human interaction</i>

B. Read this timeline about technological inventions. Then complete the sentences below using the passive voice. Follow the example.

American scientists built the first large electronic computer.	George Devol designed the first programmable robot.	John McCarthy coined the term 'Artificial Intelligence'.	Scientists developed the first robots for industrial use.	Sony introduced the Walkman.	NASA used laptop computers on the space shuttle programme.
1946	1954	1956	1950s - 1060s	1979	1980s

You will find some useful information about the passive voice in Grammar Box 1.

Example: *In 1946 the first large electronic computer was built by American scientists.*

- a. In 1954 _____ George Devol.
- b. The term 'Artificial Intelligence' _____ John McCarthy in 1956.
- c. The first robots for industrial use _____ and 1950s.
- d. The Walkman _____.
- e. _____ NASA on the space shuttle programme in the early 1980s.

Focus on Listening

A. Listen to this opinion on the importance of technology. Complete the text with the missing information.

Ours is known as the age of 1. New technologies have been a part of our daily lives for some time now. Everything around us has changed. The undeniable importance of technology in our everyday lives has inspired scientists to make 2 from time to time through their 3 for us to use, just to make our lives easier. Technology is used in all fields of life. Just consider your everyday routine and count all the technological 4 and instruments you have used over the last week and you will realise the significance of technology. No doubt you have used 5, watched TV, driven your cars, used computers and the internet. In fact, we have become dependent on technology for communication, transportation, 6, entertainment and all of life's necessities.



B. Notice the following sentences from the text:

New technologies have been an essential part of our daily lives for some time now.

Everything around us has changed.

We have become dependent on technology...

The underlined verbs are in the Present Perfect tense. Find some more examples of this tense in the text.

1. Why is the Present Perfect tense used in these sentences? Three of the following alternatives are correct.

- To connect the past and the present.
- To talk about something that happened in the past but is relevant now.
- To express daily habits and routines.
- To talk about something that started in the past and is still continuing now.
- To refer to the time that something happened in the past.

2. How is the Present Perfect formed? Look at the examples again to complete the following rule.

You will find some more useful information about the Present Perfect in Grammar Box 2.

The Present Perfect tense is formed with the auxiliary verb 1 in the Present Simple and the main verb in the 2 Participle.

Your Experience

A. Which of these technologies / gadgets have you used?

Television	Digital Camera	CD player
Tape recorder	Mobile phone	Computer / Laptop
Digital watch	Internet	Fax machine
DVD player	Headphones	Others – which?

B. Which of them do you consider most useful? Why?

C. Have any of them changed the way you live? How?

D. In what ways has technological development improved the quality of life in your community?

E. What is your own opinion about the importance of technology? Use the answers you gave to the questions above to organise your ideas. Then write a few lines about this topic.



Focus on Writing

A. In your opinion, which of the items below should count as technology? Why? Why not?



1



2



3



4



5



6



7



9



8



10

B. Read the definition of a hammer:

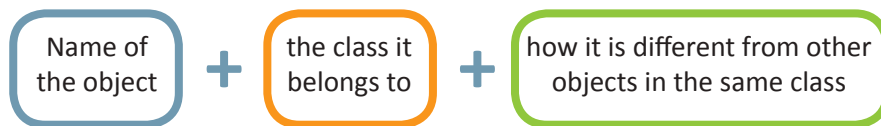
A hammer is a tool made of wood and metal that is used to bang nails into wood.

↑ ↑ ↑ ↑
 the object its class materials what we use it for

Now match the definitions to some of the items on the previous page:

1. This is a component of a car. It is made of rubber and metal. Most cars have four of them. They are designed to allow the car to move across the ground.
2. This is an instrument made of plastic and metal that is used by nurses to inject vaccines.
3. This is a device made of plastic and metal that we use to remove hair from our bodies.
4. This is a metal tool used by farmers to break open the ground so they can plant crops. In the past they were pulled by animals but today they can also be powered by machines.

C. When we give a defining description of an object we do it this way:



Example: *A tractor is a vehicle that is used by farmers to work with the soil*

D. In the table are the names of some objects and two possible classes. Choose the right class for each object.

Objects	Class	Objects	Class
thermometer	instrument machine	Windows Explorer	game internet browser
antenna	vehicle component	generator	machine tool
freezer	appliance tool	i-pod	music device appliance
jeep	device vehicle	saw	tool instrument

E. Complete the definitions with an explanation of how the object is different from other objects in the same class:

1. A bus is a vehicle that is used ...
2. A cooker is an appliance that my mother uses ...
3. A water pump is a machine that is used ...
4. A stethoscope is an instrument that a doctor uses

F. Write your own definition of a technological object and then ask a colleague to guess what it is.

**CHANGES AT
WORK**

A. Technology has changed the world of work. Which of these jobs existed in your grandparents' time?



B. Think of ways in which technology has changed the way people work in recent times. Here are some examples:

- *Taxi drivers in some cities don't get lost because they use GPS devices to locate their destinations*
- *Doctors can keep premature babies alive using incubators.*
- *Teachers can use the internet to find material to use in their classes.*

Focus on Reading

A. Read the text to find out how technology has changed our working lives. The paragraphs and the title of this text are jumbled. What is the correct order? Read each paragraph carefully to decide how it links to the others. The first two have been done for you.

In an age in which technological advances are happening on an increasingly frequent basis we are finding that these changes are having an impact on almost everything we do. Constantly evolving technology has also had an impact on the way we earn a living*. Revolutionary use of computers, such as using the Internet to make money, teleconferencing, digital arts and even digital photography has helped to change the way we work. With evolving technology, we can now work from home or do flexible hours in the office. No doubt information technology has significantly advanced the way businesses do business and the way people do their jobs all over the world. Data, information and research are available* at the speed of light, and workers everywhere have access to these.

2

* *earn a living = ganhar a vida*

* *available = disponível*

The advent of communications technologies such as the mobile phone and wireless* internet has meant people can access their information sources 24 hours a day, 7 days a week. This is a relatively recent occurrence*. With the progress that is being made, there is no telling what is in store* for the future, but we are already light years* away from where we were just 20 years ago. On the job, workers are able to access the information they need within* 2 seconds instead of* of 2 to 7 days.

* *wireless = sem fios*

* *occurrence = acontecimento*

* *in store for the future = o que o futuro reserva*

* *light years = anos luz*

* *within = dentro de / em*

* *instead of = em vez de*

In short, on-the-job information technology is used in many different ways. These include e-Commerce (shopping and dealing with customer service issues); e-Learning (studying and earning a certificate or degree without having to leave home); planning meetings and seeing and talking to people thousands of miles away and all over the world by using inexpensive hardware and software; and also by the use of wireless* communications such as cell phones.

Nowadays, and in all walks of life, thousands of different types of technology are used to help workers get their jobs done faster and easier. Software technologies have also made it possible for people to work from home or out of the office and to do this work in a much more efficient and independent manner.

In the past, we had about seven basic modes of communication: telephone, telegraph, television, radio, mail and fax machines. Radios and telephones allowed us to transport and transfer information faster than by any physical means of transport. Now, this information has been coded into bytes of information that move even faster.

It's all change in the world of work

1

adapted from: <http://www.ehow.com/about>; <http://www.associatedcontent.com/>

B. In which paragraph do you find information about the following? Write the number(s) of the paragraphs under the paragraph beginnings.

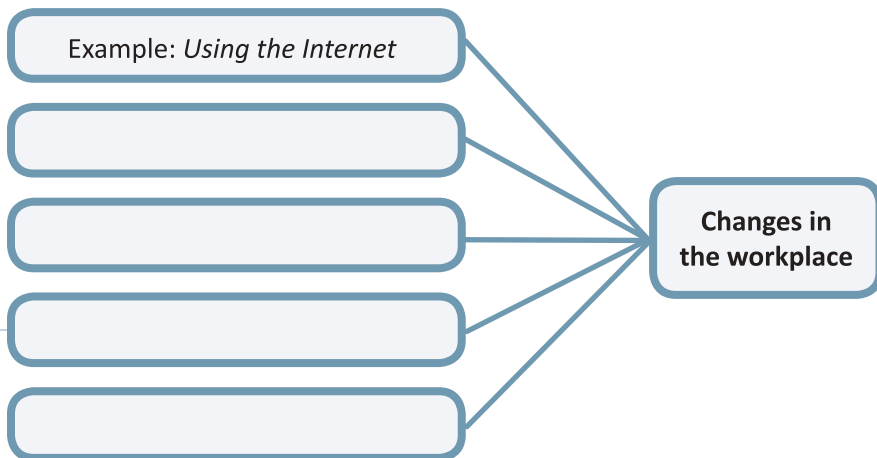
1. Software Technologies
2. Before Information Technology
3. The Information Age
4. The impact of information technology on jobs
5. Available Technologies

Don't forget that you are not supposed to write in this space.

Copy the exercise into your notebook and do it there.

In an age ...	The advent of ...	In short ...	In the past ...	Nowadays...

C. Reread the text to complete the following diagram:



Don't forget that you are not supposed to write in this space.

Copy the exercise into your notebook and do it there.

D. Now develop your notes into a short paragraph beginning with the phrase below. Try to use your own words rather than the words of the text:

*Technology has certainly changed the way that people work.
For example,...*

Your Experience

A. Much of the technology in the world has been designed with teenagers in mind. What about East Timorese teenagers? What technology do you use that older members of your family don't? Write a few lines explaining what you use and what you use it for.

B. What technology is available in your community and school? Make a list. Remember that technology is the tools, machines, materials or sources of power that make people's lives easier.

C. Now make a prioritised list of other technology that you would like to have in your school. Compare your list with your colleagues. In groups negotiate a shortlist of the 5 most important items. Explain your list to the class, saying why you think the items are important.



Getting Started

SECTION C

SOCIAL NETWORKING

A. Twitter is a social networking service that allows you to send short written messages of up to 140 characters (including spaces and punctuation), called “tweets”, to your friends, or “followers” to let them know what you are doing and thinking and to ask them questions.

Here are some examples of tweets:

“Yesterday my mum made Ikan Pepes and we invited my aunt, uncle and two cousins to lunch. The food was great but I had to wash up afterwards!” (140 characters)

“Just been to see the East Timorese band Galaxy here in Sines, Portugal. Way cool!” (79 characters)

“Help! I can’t find my trainers! Have you got them?” (50 characters)

Now write some tweets of your own



B. Questions! Answer these questions for yourself and then compare your answers with a colleague.

1. Would you ever post a video of yourself to YouTube?
2. Would you use your own name or a fake name if you wrote a tweet?
3. Would you pay to use a service like Twitter?
4. Do you know anyone who has written something for the internet like a blog or web page?
5. Have you ever ‘Googled’ yourself online?



Focus on Reading

A. What are the benefits and possible dangers of social media? Read the text to find out.

Are social networking sites good for society?

The popularity of social networking sites such as Facebook, MySpace, Twitter, LinkedIn, and Classmates.com is growing every day. Many users say these sites are good for our society, but others think that the dangers of social media are greater than the benefits.

* *proponents = defensores/apoiantes*

* *attention span = capacidade de concentração*

Proponents* of social networking sites argue that these online communities promote increased communication with friends and family, familiarize people with valuable computer skills, and allow contact with people from around the world. On the other hand, opponents argue that social networking sites expose children to dangerous people, increase the chance of catching a computer virus, lower worker productivity and reduce people's attention spans*.

SixDegrees.com is considered to be the first social networking site because it was the first website that allowed users to create personal profiles and link to friends. Friendster, created in 2002, popularized social networking in the US before MySpace (2003), Facebook (2004), and Twitter (2006) took over as the most widely used social networking sites.

Social networking and blogging sites account for 17% of all time spent on the Internet. Users in the US spend an average* of five hours and 46 minutes per month on Facebook. Although this site started out as a bit of fun, it has turned into something more important. Social media have really changed the way people relate to one another and live their social lives. They are now a permanent presence in our global social reality.

Russians spend more time on social networking sites than people in any other country; an average* of 6.6 hours per month compared to the worldwide average* of 3.7 hours per month. Social networking sites are growing faster than the rules, laws, and unofficial etiquette* regulating their use. For example, businesses worldwide have to decide whether to allow access to social networking sites in the office and run the risk of decreased worker productivity and security breaches*.

As social networking sites play an increasingly important part in our modern culture, some people think that there are more benefits than downsides*, while others believe the dangers are more numerous than the upsides*.

* *average = média*

* *etiquette = regras de conduta*

* *breaches = fugas*

* *downsides = desvantagens*

* *upsides = vantagens*

adapted from: www.smartmarketmovie.com



1. Now complete this table with information from the text. Use your own words as far as possible. There are two examples.

SOCIAL NETWORKS	
Arguments in favour	Arguments against
<i>We can be more in touch with our friends</i>	<i>Children may meet bad people on the internet</i>

Don't forget that you are not supposed to write in this space.

Copy the exercise into your notebook and do it there.



2. Reread the third, fourth and fifth paragraphs. Ask questions for these short answers.

Example:
SixDegrees.com



What is considered to be the first social networking site?

- a) in 2002 b) 17% c) 3.7 hours per month

B. The text contains arguments both for and against social networking. In a text of this type, the writer contrasts different ideas or sides of an argument. Here is an example:

Some people think children should not use a computer before the age of 10 but others believe that the sooner they start the better.

You will find some useful information about linkers in Grammar Box 4.

In this example, the word 'but' is used to signal that there is a contrast of ideas. Reread the text on the previous page and find some more words or phrases that link contrasting ideas or opinions.

C. In exercise A.1. above you listed some contrasting ideas from the text. Now write some sentences using these ideas. Use linkers such as but, although, on the other hand, however...

Example:
Social networking sites allow people to stay in touch with their friends. However, these sites also encourage people to spend more time online and less time interacting face-to-face.



For help with these modal verbs
see Grammar Box 4.

D. Netiquette, a combination of the words network and etiquette, is the social code of the internet. Look at the opinions and use them to make some netiquette rules. Use must or mustn't. The first one has been done as an example.

Opinions

- I. Capital letters look like you are shouting
- II. If you tell lies online and people find out, they will block you from the site.
- III. Personal insults (Flames) in forums will make people stop wanting to talk to you.
- IV. Some language (like swearing) is inappropriate especially if you wouldn't use it face-to-face.
- V. If you forward spam to your friends they may catch a virus.

Core netiquette rules

- I. You mustn't write messages using only capital letters.
- II. You must ...
- III. You mustn't ...
- IV. You must ...
- V. You mustn't ...

Can you extend the list of core netiquette rules? Some of the ideas below might help you:

slang words and idioms	topics in forums	repeat questions in forums	copyright material
personal information	passwords	antivirus programme	racist

Your Experience

A. Make a list of social rules that are important to you.

Examples: *You must wait your turn to speak*
You mustn't repeat a secret.

B. Imagine you want to join a new online social network. What information would you be happy to give about yourself?

C. What is your opinion? Do you think social networking will become popular in East Timor? Why/why not? Write a short paragraph.

Grammar Box 1 – Passive Voice

Examples from the unit texts:

Technology **is used** in all fields of life.

SixDegrees.com **is considered** to be the first social networking site.

When do we use the passive?

Passives are used whenever an action is more important than the agent – for example, in reporting the news, in public notices or scientific experiments or when we don't know who the agent is:

Look at these examples:

Technology **is used** in all fields of life.

Computers in many countries **have been infected** by the Valentine virus.

My iPod **has been stolen**.

How do we form the passive?

Identify the subject (S), verb (V) and object (O).



The thief stole the computer.

Place the subject before the verb.

The computer...

Add the verb 'to be' in the same tense as the original verb (steal).

The computer was...

Add the past participle* of the original (main) verb.

The computer was stolen...

Add 'by' and the subject (if necessary)

The computer was stolen (by the thief).

*What is the past participle?

In a verb table the past participle is the third verb form:

Infinitive	Past Simple	Past Participle
be	was	been
do	did	done
see	saw	seen
steal	stole	stolen
work	worked	worked

In passive constructions by + the agent are only mentioned when necessary.

Example: ... new information technology jobs are being created **by Apple**

	ACTIVE	PASSIVE
Present Simple	<p>Technology centres create new jobs.</p> <p>Good intentions don't create new jobs</p> <p>Do manufactures create new jobs?</p>	<p>New jobs are created by technology centres.</p> <p>New jobs aren't created by good intentions.</p> <p>Are new jobs created by manufacturers?</p>
Past Simple	<p>Technology centres created new jobs.</p> <p>Good intentions didn't create new jobs</p> <p>Did manufactures create new jobs?</p>	<p>New jobs were created by technology centres.</p> <p>New jobs weren't created by good intentions.</p> <p>Were new jobs created by manufacturers?</p>
Present Continuous	<p>Technology centres are creating new jobs.</p> <p>Good intentions aren't creating new jobs</p> <p>Are manufactures creating new jobs?</p>	<p>New jobs are being created by technology centres.</p> <p>New jobs aren't being created by good intentions.</p> <p>Are new jobs being created by manufacturers?</p>
Past Continuous	<p>Technology centres were creating new jobs.</p> <p>Good intentions weren't creating new jobs</p> <p>Were manufactures creating new jobs?</p>	<p>New jobs were being created by technology centres.</p> <p>New jobs weren't being created by good intentions.</p> <p>Were new jobs being created by manufacturers?</p>
Present Perfect	<p>Technology centres have created new jobs.</p> <p>Good intentions haven't created new jobs</p> <p>Have manufactures created new jobs?</p>	<p>New jobs have been created by technology centres.</p> <p>New jobs haven't been created by good intentions.</p> <p>Have new jobs been created by manufacturers?</p>
Past Perfect	<p>Technology centres had created new jobs.</p> <p>Good intentions hadn't created new jobs</p> <p>Had manufactures created new jobs?</p>	<p>New jobs had been created by technology centres.</p> <p>New jobs hadn't been created by good intentions.</p> <p>Had new jobs been created by manufacturers?</p>
Future Simple	<p>Technology centres will create new jobs.</p> <p>Good intentions won't create new jobs</p> <p>Will manufactures create new jobs?</p>	<p>New jobs will be created by technology centres.</p> <p>New jobs won't be created by good intentions.</p> <p>Will new jobs be created by manufacturers?</p>

Extra practice

Change the following sentences from the active to the passive. Use the words given.

1. Many companies are setting up websites.
Websites
2. Translation experts have recently devised smart software.
Smart software
3. Will the programmers translate the website into a number of languages?
Will the website
4. Computers provide on-line bilingual dictionaries.
On-line bilingual dictionaries
5. Many people are buying Christmas presents on the internet.
Christmas presents
6. Technology hasn't affected my life.
My life
7. The shop had already sold the laptop I wanted.
The laptop
8. Did they steal the passwords?
Were

Grammar Box 2 – Present Perfect Tense

Look at the examples:

The role of games in education has increased in recent years.
They have just developed a game called 'Supercharged'.

The Present Perfect is used

A. To talk about something that started in the past and is still continuing now. Time expressions: for and since.

Example: *I have had a digital camera for over a year.*
I have worked as a computer consultant since 1997.

B. To talk about something that happened in the past and is part of our experience. Time expressions: before, ever and never.

Example: *Have you ever been to an internet café?*
This mouse has never worked properly.
He hasn't seen the programme before.

C. To talk about something that happened in the past but the result is important now. Time expressions: recently, just, already and yet.

Example: *He has already built a robot.*
I haven't tried this activity yet.
They have just opened a new internet café in Dili.
We have had a lot of hacker activity recently.

AFFIRMATIVE		
I	have	Past Participle (eaten)
You	have	
He/She/It	has	
We	have	
You	have	
They	have	
NEGATIVE		
I	have not	Past Participle (eaten)
You	have not	
He/She/It	has not	
We	have not	
You	have not	
They	have not	
INTERROGATIVE		
Have	I	Past Participle (eaten) ?
Have	you	
Has	he/she/it	
Have	we	
Have	you	
Have	they	

AFFIRMATIVE RESPONSE		
Yes,	I	have.
	you	have.
	he/she/it	has.
	we	have.
	you	have.
	they	have.
NEGATIVE RESPONSE		
No,	I	have not.
	you	have not.
	he/she/it	has not.
	we	have not.
	you	have not.
	they	have not.

* have not = haven't; has not = hasn't

Extra practice

Fill in the blanks with the Present Perfect of the verbs in brackets.

- Demand for new services _____ (*inspire*) scientists to improve cellular phones.
- Some gadgets _____ (*help*) to improve our quality of life.
- Technology _____ (*not solve*) the world's problems.
- Technological advances _____ already _____ (*transform*) work habits.
- My sister _____ (*become*) addicted to video games.
- _____ (*they/decide*) where to install the new computers?
- _____ (*not/ yet/ receive*) the new delivery of computer parts.

Grammar Box 3 – Linkers of Contrast

Linkers are used to relate ideas in different parts of a sentence or text.

In a text that gives arguments for or against, the following words are used to give opposite, contrasting ideas:

Linker function	Examples
contrast ideas, facts or opinions	but, although, though, however, yet, in spite of, while, despite, ...

These linkers are used to link:

two opposite or positive and negative ideas
I like ice-cream but I don't like chocolate

a context and expectation and a surprise
Although it was raining heavily, we went for a picnic

a rule and an exception
Laptop computers are very versatile, though some of them are not very user-friendly.

a contrast or contradiction
He has given millions to charity. However, he pays his workers badly.

two sides of an argument
Children want to spend their time on the internet while parents want them to do their homework.

Extra practice

Choose the most appropriate linker word to complete the following sentences.

1. Machines and computers are responsible for the dramatic changes at work. _____ (*On the other hand | although | in spite of*) they are also creating new jobs.
2. In the past people had careers that lasted a lifetime; _____ (*in spite of | on the one hand | however*), technology is forcing them to change jobs these days.
3. They felt secure about their future. _____ (*although | but | in spite of*) this is no longer true.
4. _____ (*although | on the one hand | however*) Facebook began in 2004 as a site for college students, by March 2009 one-third of its users worldwide were in the 35-49 age group.
5. Social networks have become the most popular way of finding new friends _____ (*although | on the one hand | while*) dating agencies are getting fewer clients.

Grammar Box 4 – Modal Verbs: must, mustn't

Modal verbs are used to express our intentions / attitudes / interpretations. They help us express such ideas as probability, obligation, need, habit, permission, ability, etc. We looked at some modal verbs in unit 1.3. Here, we are building on what we already know.

Look at the examples:

You must choose a safe password when you go online = here **must** expresses obligation

You mustn't give anyone your real name in a chat room = here **mustn't** expresses prohibition

The same modal verb can have a number of different meanings, for example:

Must is used to express:

obligation: You must take a break every half an hour when you are on the computer.

certainty: Your eyes must be tired after looking at the screen for so long.

prohibition (when in the negative): You mustn't leave your computer on overnight.

The grammar of these 'helping' verbs is different from other verbs:

They are the same for all persons

They don't have different tenses (there are no -s, -ing or -ed forms)

They are followed by a bare infinitive (infinitive without 'to')

Interrogative and negative forms are made without the auxiliary DO.