МИНИСТЕРСТВО СЕЛЬСКОГО ХОЗЯЙСТВА И ПРОДОВОЛЬСТВИЯ РБ

УЧРЕЖДЕНИЕ ОБРАЗОВАНИЯ

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ENGLISH
ACADEMIC READING AND SPEECH PRACTICE

Electronic Learning Guide

ДЛЯ МАГИСТРАНТОВ АГРОТЕХНИЧЕСКИХ СПЕЦИАЛЬНОСТЕЙ

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UNIT I

INTERNATIONAL SCIENTIFIC COOPERATION

§ 1

SCIENCE

☐ ***Read***

☐ ***Write***

☐ ***Speak***

1 **Skim the text. Create the "big picture" or main idea of the text.**

2 **Read the text. Pay attention to text features like the introduction, main body and conclusion. Establish their purpose.**

1. The word "science" comes from Latin word "scientia", which means "knowledge". It probably brings to mind many different pictures: a fat textbook, white lab coats and microscopes, an astronomer peering through a telescope, a naturalist in the rainforest, Einstein's equations scribbled on a chalkboard, the launch of the space shuttle, bubbling beakers …. All of those images reflect some aspect of science, but none of them provides a full picture because science has so many facets. These images all show an aspect of science, but a complete view of science is more than any particular instance.

Science may sometimes seem like a collection of isolated and static facts listed in a textbook, but that's only a small part of the story. Just as importantly, science is also a process of discovery that allows us to link isolated facts into coherent and comprehensive understandings of the natural world.

2. The process of science is a way of building knowledge about the universe and constructing new ideas that illuminate the world around us. Those ideas are inherently tentative, but as they cycle through the process of science again and again and are tested and retested in different ways, we become increasingly confident in them. Furthermore, through this same iterative process, ideas are modified, expanded, and combined into more powerful explanations. So, although the process of science is iterative, ideas do not churn through it repetitively. Instead, the cycle actively serves

to construct and integrate scientific knowledge. That knowledge is useful for all sorts of things: from designing bridges, to slowing climate change, to prompting frequent hand washing during flu season.

Scientific knowledge can improve the quality of life at many different levels from the routine workings of our everyday lives to global issues. Science informs public policy and personal decisions on energy, conservation, agriculture, health, transportation, communication, defence, economics, leisure, and exploration. It's almost impossible to overstate how many aspects of modern life are impacted by scientific knowledge.

Scientific knowledge allows us to develop new technologies, solve practical problems, and make informed decisions both individually and collectively. Because its products are so useful, the process of science is intertwined with those applications:

- New scientific knowledge may lead to new applications.
- New technological advances may lead to new scientific discoveries.
- Potential applications may motivate scientific investigations.

3. Science is a way of discovering what's in the universe and how those things work today, how they worked in the past, and how they are likely to work in the future. Scientists are motivated by the thrill of seeing or figuring out something that no one has before.

The knowledge generated by science is powerful and reliable. It can be used to develop new technologies, treat diseases, and deal with many other sorts of problems. Science is continually refining and expanding our knowledge of the universe, and as it does, it leads to new questions for future investigation. Science will never be "finished." Scientists work in many different ways, but all science relies on testing ideas by figuring out what expectations are generated by an idea and making observations to find out whether those expectations hold true. Science is a global human endeavour. People all over the world participate in the process of science.

3 **Read the text again and fill in the table below. Compare your results with your partner.**

Part of the text	✔ I know	+ New information	- I think differently	? Need to learn more	! Controversial point
1.					
2.					
3.					

4 **Write down any new or difficult words. Look these up in a dictionary and try to use them in a sentence or explain what they mean in your own words.**

5 **Activate the words and word combinations from the box below. Find the sentences with them in the text. Read the sentences and translate them in writing.**

to be useful for // to rely on // with applications // to illuminate the world // powerful explanations // to inform // to allow // to bring to mind

6 **Choose the one word or phrase that best keeps the meaning of the original sentence if it is substituted for the underlined word or phrase.**

1. The author discusses all ***facets*** of most engineering fields.

a. prospects *b. aspects* *c. issues* *d. forms*

2. Most of our meetings were ***devoted*** to discussing scientific problems.

a. dedicated *b. confined* *c. conformed* *d. introduced*

3. Is there any ***evidence*** for believing that?

a. proof *b. tendency* *c. opposition* *d. chance*

4. She is very ***dedicated*** to her research work.

a. interested in *b. committed to* *c. tired of* *d. disappointed with*

5. He made no ***endeavour*** to help us.

a. effort *b. decision* *c. plan* *d. prediction*

6. How is your ***study*** progressing?

a. topic *b. investigation* *c. attempt* *d. procedure*

7 **Ask questions of the material as you read. Use the questions devised by reporters: *Who, What, When, Where, Why and How*. Discuss them with you partner(s).**

8 **Decide if the following statements are facts, opinion or both. Prove your choice.**

	FACT	OPINION
1. Scientific knowledge can improve the quality of life at many different levels.		
2. Scientists work in many different ways.		
3. Many aspects of modern life are impacted by scientific knowledge.		
4. Science is built up of facts, but an accumulation of facts is no more a science.		
5. Science will never be "finished".		

9 **Prepare an outline for the text «What is science? », using the following key word combinations:**

a body of knowledge	a process of discovery
scientific knowledge	to be motivated
to build knowledge	to collect facts
to integrate scientific knowledge	to construct ideas
to expand knowledge	to make decision
to refine knowledge	to develop new technologies
a process of science	to solve problems
scientific investigations	technological advances

OUTLINE

Topic: ….

1. Introduction
   1.1 Definition of the topic
   1.2 Significance of the Study
   1.3 Definition of Terms
2. Body
   2.1
   2.2
   2.3
3. Conclusion
   3.1 Conclusion
   3.2 Recommendations

10 **Prepare a brief talk on science. Discuss the worth mentioning information with your colleagues. Be ready to answer the questions that may follow. Use the mind map.**

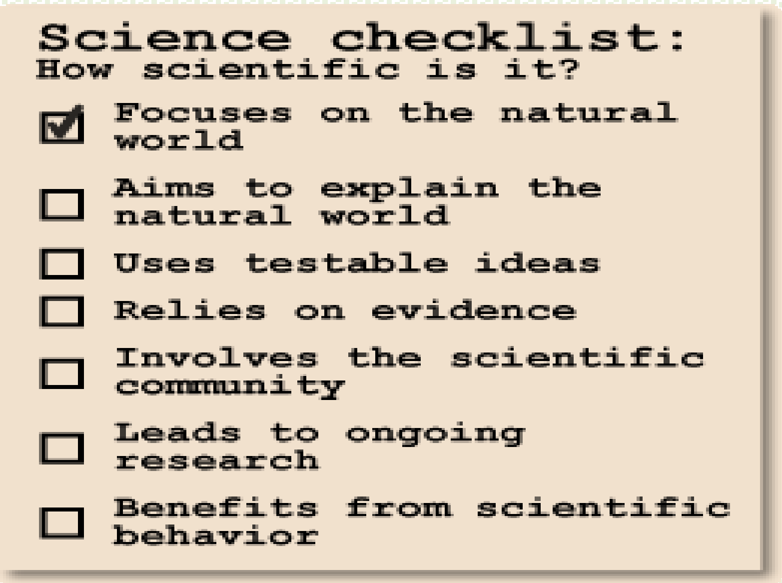
Science

- What is science?
- How does it work?
- Why is it important?

11 **Comment on the following statements. Supply possible reasons for each your conclusion.**

1. Science is both a body of knowledge and process for building that knowledge.
2. Sience aims to build increasingly broad and coherent explanations of the natural world.
3. Answering one question often leads to other questions.
4. Science works only with testable ideas.
5. Scientists base their ideas on evidence from the natural world.
6. Scientific knowledge is open to question and revision as new ideas surface and new evidence is discovered.

12 **Find out what makes science science. Elicit the information from the text and use additional information from your general knowledge of the subject or any other source of information that is coherent to the subject of science.**


Science checklist:
How scientific is it?

- [x] Focuses on the natural world
- [ ] Aims to explain the natural world
- [ ] Uses testable ideas
- [ ] Relies on evidence
- [ ] Involves the scientific community
- [ ] Leads to ongoing research
- [ ] Benefits from scientific behavior

☐ Translate

13 **Make up a written translation of the text.**

PARTICIPANTS IN SCIENCE BEHAVE SCIENTIFICALLY

Science is sometimes misconstrued as an elite endeavor in which one has to be a member of "the club" in order to be taken seriously. That's a bit misleading. In fact, science is now open to anyone (regardless of age, gender, religious commitment, physical ability, ethnicity, country of origin, political views, nearsightedness, favorite ice cream flavor – whatever!) and benefits tremendously from the expanding diversity of perspectives offered by its participants. However, science only works because the people involved with it behave "scientifically" – that is, behave in ways that push science forward.

But what exactly does one have to do to behave scientifically? Here is a scientist's code of conduct:

1. Pay attention to what other people have already done. Scientific knowledge is built cumulatively. If you want to discover exciting new things, you need to know what people have already discovered before you. This means that scientists study their fields extensively to understand the current state of knowledge.

2. Expose your ideas to testing. Strive to describe and perform the tests that might suggest you are wrong and/or allow others to do so. This may seem like shooting yourself in the foot but is critical to the progress of science. Science aims to accurately understand the world, and if ideas are protected from testing, it's impossible to figure out if they are accurate or inaccurate!

3. Assimilate the evidence. Evidence is the ultimate arbiter of scientific ideas. Scientists are not free to ignore evidence. When faced with evidence contradicting his or her idea, a scientist may suspend judgment on that idea pending more tests, may revise or reject the idea, or may consider alternate ways to explain the evidence, but ultimately, scientific ideas are sustained by evidence and cannot be propped up if the evidence tears them down.

4. Openly communicate ideas and tests to others. Communication is important for many reasons. If a scientist keeps knowledge to her- or himself, others cannot build upon those ideas, double-check the work, or devise new ways to test the ideas.

5. Play fair: Act with scientific integrity. Hiding evidence, selectively reporting evidence, and faking data directly thwart science's main goal – to construct accurate knowledge about the natural world. Hence, maintaining high standards of honesty, integrity, and objectivity is critical to science.

§ 2

SCIENCE and AGRICULTURE

☐ ***Read***

☐ ***Write***

☐ ***Speak***

1 **Look at the title of the text and ask yourself:**
What is the text about?

2 **Skim the text very quickly to get a general impression.**

3 **Read the text. Pay attention how the text is organized. Ask your partner:**
What are the main sections of the text?

Early knowledge of agriculture was a collection of experiences verbally transmitted from farmer to farmer. Some of this ancient lore had been preserved in religious commandments, but the traditional sciences rarely dealt with a subject seemingly considered so commonplace. Although much was written about agriculture during the Middle Ages, the agricultural sciences did not then gain a place in the academic structure. Eventually, a movement began in Central Europe to educate farmers in special academies, the earliest of which was established at Keszthely, Hungary, in 1796. Students were still taught only the experiences of farmers, however.

The scientific approach was inaugurated in 1840 by German researcher Justus von Liebig. His work launched the systematic development of the agricultural sciences. In Europe, a system of agricultural education soon developed that comprised secondary and postsecondary instruction. The old empirical-training centres were replaced by agricultural schools throughout Europe and North America. Under Liebig's continuing influence, academic agriculture came to concentrate on the agricultural sciences.

Agricultural sciences deal with food and fibre production and processing. They include the technologies of soil cultivation, crop cultivation and harvesting, animal production, and the processing of plant and animal products for human consumption and use. Food is the most basic human need. The domestication and cultivation of plants and animals beginning more than 11,500 years ago were aimed at ensuring that this need was met, and then as now these activities also fit with the relentless human drive to understand and control Earth's biosphere. Scientific methods have been applied widely, and the results have revolutionized agricultural production. Under the conditions of prescientific agriculture, in a good harvest year, six people can produce barely enough food for themselves and four others. Advanced technologies have made it possible for one farmer to produce food for more than 100 people. The farmer has been enabled to increase yields per acre and per animal; reduce losses from diseases, pests, and spoilage; and augment net production by improved processing methods.

The agricultural sciences can be divided into six groups: soil and water sciences, plant sciences, animal sciences, food sciences and other post-harvest technologies, agricultural engineering and agricultural economics. In all fields, the general pattern of progress toward the solution of specific problems or the realization of opportunities is: (1) research to more accurately define the functional requirements to be served; (2) design and development of products, processes, and other means of better serving these requirements; and (3) extension of this information to introduce improved technologies to the agricultural industries. This has proved to be a tremendously successful approach and is being used the world over.

Soil and water sciences deal with the geological generation of soil, soil and water physics and chemistry, and all other factors relevant to soil fertility. Public and private research into chemical fertilizers and soil management has made it possible for farmers to aid nature in making specific soils more productive.

Plant sciences include applied plant physiology, nutrition, ecology, breeding and genetics, pathology, and weed science, as well as crop management.

Animal sciences comprise applied animal physiology, nutrition, breeding and genetics, livestock and poultry management, animal ecology and ethology.

Food sciences and other post-harvest technologies underlie the processing, storage, distribution, and marketing of agricultural commodities and by-products. Research having particular significance to post-harvest technology includes genetic engineering techniques that increase the efficiency of various chemical and biological processes and fermentations for converting biomass to feedstock and for use in producing chemicals that can replace petroleum-based products.

Agricultural engineering includes appropriate areas of mechanical, electrical, environmental, and civil engineering, construction technology, hydraulics, and soil mechanics.

The field of agricultural economics deals with agricultural finance, policy, marketing, farm and agribusiness management, rural sociology, and agricultural law. Agricultural policy is concerned with the relations between agriculture, economics, and society.

Related agricultural sciences are also being developed today.

Rural sociology, a young discipline, involves a variety of research methods, including behaviour study developed from studies in decision making in farm management.

Agricultural work science arose in response to the rural social problems. The improvement of work procedures, appropriate use of labour, analysis of human capacity for work, and adjustment of mechanized production methods and labour requirements represent the main objects of this branch of ergonomics research.

Agricultural meteorology deals with the effects of weather events, and especially the effects of their variations in time and space, on plant and animal agriculture. Atmospheric factors such as cloud type and solar radiation, temperature, vapour pressure, and precipitation are of vital interest to agriculturalists. Agricultural meteorologists use weather and climatic data in enterprise risk analysis as well as in short- and long-range forecasting of crop yields and animal performance.

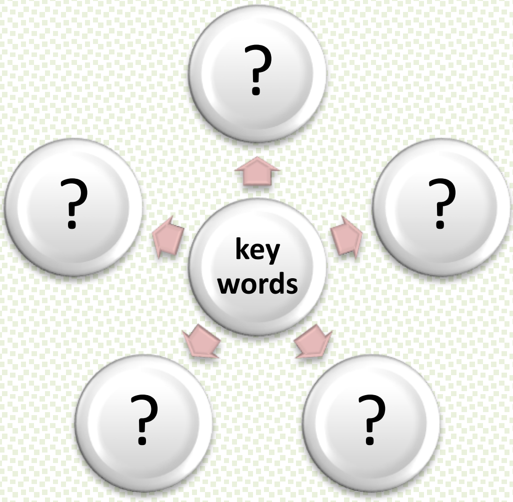
The agricultural sciences are poised to enter a new era, armed with ever more sophisticated research technologies in their continuing drive to better harness nature for the ultimate benefit of human beings everywhere. Although broad and deep scientific investigations have been made in the biological, physical, and social realms related to agriculture, the need persists for additional research to close remaining gaps in knowledge today.

4 **Re-read the text with a pen in hand. Find important phrases or statements. But don't limit yourself. Write anything that seems important or striking. Take notes on questions (don't trust your memory). Exchange your notes with your partner and discuss them.**

5 **Make a list of the new words which you think will be useful for you in the future. Give:**

- definitions of the words
- indication of whether they are nouns, verbs, adjectives etc.
- phrases in which the word occurs
- other words with the same meaning
- other forms of the words

6 Define a few key words in your word journal. Recommend your partner to practise them.



7 Reconstruct the author’s idea.

Write down the passage you wish to put into your own words.
Underline the main points.

↓

List some key ideas, concepts, and phrases. Where possible, note down alternative phrases or synonyms for each of these.

↓

Identify the main points in your words.

↓

Can you simplify your words further? (This may not always be possible.)

↓

Use your words and phrases in steps 3 and 4 to restate the points, without looking at the original text.

↓

This is your reconstructed version of the author’s idea.

8 **Study the introduction to the text and decide how it could be shortened. List your suggestions and bring them into classroom. Discuss with your partners.**

SUGGESTIONS FOR SHORTENING
A.
B.
C.
D.

9 **Study the main part of the text. Guess the six groups of agricultural sciences and briefly describe them. Use prompts.**

Mechanical, civil, electrical, environmental, technology, soil, mechanics, to construct.
Soil, generation of soil, water physics, soil fertility, chemical fertilizers, soil management, to aid nature, to make productive.
Commodities, processing, storage, distribution, products, techniques, to increase, efficiency, to feedstock, to replace.
Plant, ecology, genetics, breeding, weed, crops, management.
Finance, law, policy, marketing, agribusiness, management, agriculture, economics.
Animals, breeding, genetics, livestock, poultry, management, animal ecology.

10 **Prepare an outline for the text «Agricultural sciences?», using the following key word combinations:**

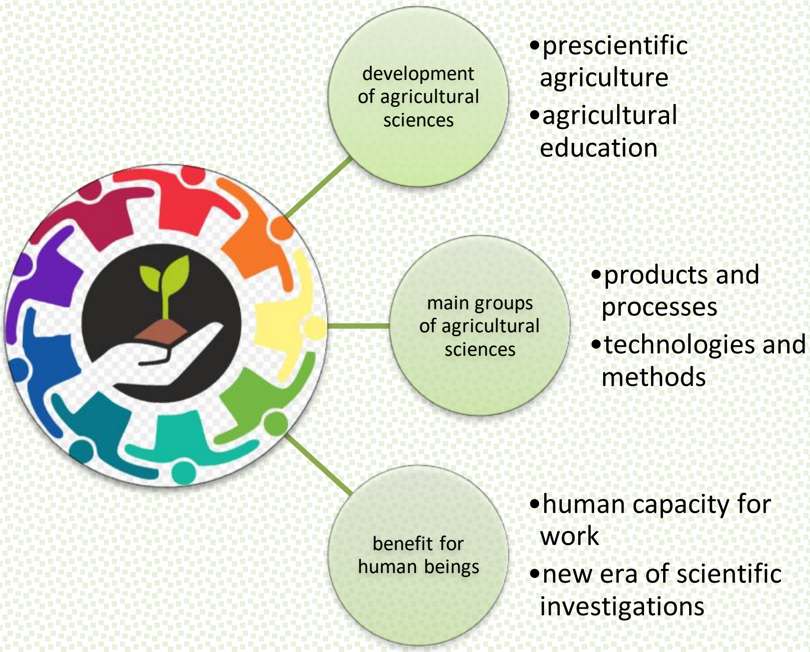
early knowledge of agriculture	human consumption
scientific approach	scientific methods
to educate farmers	advanced technologies
a system of agricultural education	experiences of farmers
to be divided into	agricultural production
scientific investigations	soil cultivation
animal production	crop growing
food production	farm management

OUTLINE

Topic: ….

1. Introduction
    - 1.1 Definition of the topic
    - 1.2 Significance of the Study
    - 1.3 Definition of Terms
2. Body
    - 2.1
    - 2.2
    - 2.3
3. Conclusion
    - 3.1 Conclusion
    - 3.2 Recommendations

11 **Prepare a brief talk on agricultural sciences. Discuss the worth mentioning information with your colleagues. Be ready to answer the questions that may follow. Use the mind map.**

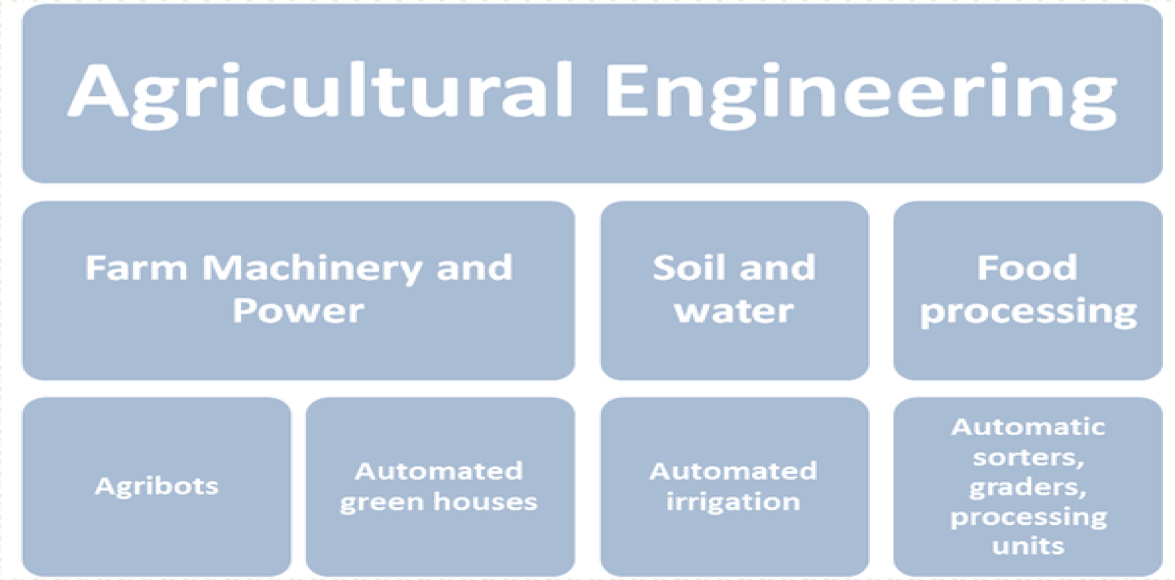


Workshop

12 **Write a process description of your own choice.**

A.

B.



☐ *Translate*

13 **Make up a written translation of the text.**

Agricultural science began with Gregor Mendel's genetic work, but in modern terms might be better dated from the chemical fertilizer outputs of plant physiological understanding in eighteenth century Germany. In the United States, a scientific revolution in agriculture began with the Hatch Act of 1887, which used the term "agricultural science". The Hatch Act was driven by farmers' interest in knowing the constituents of early artificial fertilizer. The Smith-Hughes Act of 1917 shifted agricultural education back to its vocational roots, but the scientific foundation had been built. After 1906, public expenditures on agricultural research in the US exceeded private expenditures for the next 44 years.

Intensification of agriculture since the 1960s in developed and developing countries, often referred to as the Green Revolution, was closely tied to progress made in selecting and improving crops and animals for high productivity, as well as to developing additional inputs such as artificial fertilizers and phytosanitary products.

As the oldest and largest human intervention in nature, the environmental impact of agriculture in general and more recently intensive agriculture, industrial development, and population growth have raised many questions among agricultural scientists and have led to the development and emergence of new fields. These include technological fields that assume the solution to technological problems lies in better technology, such as integrated pest management, waste treatment technologies, landscape architecture, genomics, and agricultural philosophy fields that include references to food production as something essentially different from non-essential economic 'goods'. In fact, the interaction between these two approaches provides a fertile field for deeper understanding in agricultural science.

Nowadays agricultural science is a broad multidisciplinary field that encompasses the parts of exact, natural, economic and social sciences that are used in the practice and understanding of agriculture.

The two terms are often confused. However, they cover different concepts:

1. Agriculture is the set of activities that transform the environment for the production of animals and plants for human use. Agriculture concerns techniques, including the application of agronomic research.

2. Agronomy is research and development related to studying and improving plant-based agriculture.

Modern agricultural sciences include research and development on production techniques (e.g., irrigation management, recommended nitrogen inputs); improving agricultural productivity in terms of quantity and quality (e.g., selection of drought-resistant crops and animals, development of new pesticides, yield-sensing technologies, simulation models of crop growth, in-vitro cell culture techniques); transformation of primary products into end-consumer products (e.g., production, preservation, and packaging of dairy products).

With the exception of theoretical agronomy, research in agronomy, more than in any other field, is strongly related to local areas. It can be considered a science of ecoregions, because it is closely linked to soil properties and climate, which are never exactly the same from one place to another. Many people think an agricultural production system relying on local weather, soil characteristics, and specific crops have to be studied locally. Others feel a need to know and understand production systems in as many areas as possible, and the human dimension of interaction with nature.

New technologies, such as biotechnology and computer science (for data processing and storage), and technological advances have made it possible to develop new research fields, including genetic engineering, agrophysics, improved statistical analysis, and precision farming. Balancing these, as above, are the natural and human sciences of agricultural science that seek to understand the human-nature interactions of traditional agriculture, including interaction of religion and agriculture, and the non-material components of agricultural production systems.

§ 3

RESEARCH

☐ ***Read***

☐ ***Write***

☐ ***Speak***

1 **Establish your purpose for reading: narrative = for literary experience / enjoyment; expository = for information; functional = to perform tasks / follow directions; educational = to improve reading skills, etc.**

2 **Preview the text to get an idea of what it is about without reading the main body of the text.**

3 **Predict the contents of the text and write questions about it.**

QUESTIONS BEFORE READING

Predictions

1. ____?
2. ____?
3. ____?
4. ____?
5. ____?

Research is a process to discover new knowledge. Research is also defined as a systematic investigation (i.e., the gathering and analysis of information) designed to develop or contribute to generalizable knowledge. The object of research is to extend human knowledge of the physical, biological, or social world beyond what is already known. Research can be done with human beings, animals, plants, other organisms and inorganic matter.

There are three main purposes of research: exploratory, descriptive, explanatory.

Exploratory research is conducted to explore a group of questions. The answers and analytics may not offer a final conclusion to the perceived problem. It is conducted to handle new problem areas which haven't been explored before. This exploratory process lays the foundation for more conclusive research and data collection.

Descriptive research focuses on expanding knowledge on current issues through a process of data collection. Descriptive studies are used to describe the behavior of a sample population. In a descriptive study, only one variable is required to conduct the study. The three main purposes of descriptive research are describing, explaining, and validating the findings.

Explanatory research or causal research is conducted to understand the impact of certain changes in existing standard procedures. Conducting experiments is the most popular form of casual research.

A research can be of any type. The basic idea behind the concept of research is to search the data or information based on a specific theory or work. Research is different than other forms of discovering knowledge (like reading a book) because it uses a systematic process called the scientific method. Following are the types of scientific methods:

Basic research means data collecting to enhance knowledge. The main motivation is knowledge expansion. It is a non-commercial research that doesn't facilitate in creating or inventing anything. For example: an experiment to determine a simple fact.

Applied research focuses on analyzing and solving real-life problems. This type refers to the study that helps solve practical problems using scientific methods. Studies play an important role in solving issues that impact the overall well-being of humans. For example: finding a specific cure for a disease.

Problem oriented research is conducted to understand the exact nature of a problem to find out relevant solutions. The term "problem" refers to multiple choices or issues when analyzing a situation.

Problem solving research is performed by companies to understand and resolve their own problems. The problem-solving method uses applied research to find solutions to the existing problems.

Qualitative research is a process that is about inquiry. It focuses is everyday life and people's experiences and helps create in-depth understanding of problems or issues in their natural settings. This is a non-statistical method.

Quantitative research is a structured way of collecting data and analyzing it to draw conclusions. Unlike qualitative methods, this method uses a computational and statistical process to collect and analyze data. Quantitative data is all about numbers.

There are many kinds of research, however, most of them fall into two categories: descriptive and experimental.

A descriptive study is one in which information is collected without changing the environment. Descriptive studies answer questions such as "what is" or "what was”. Sometimes these are referred to as “correlational” or “observational” studies. Descriptive studies are usually the best methods for collecting information that will demonstrate relationships and describe the world as it exists. These types of studies are often done before an experiment to know what specific things to manipulate and include in an experiment.

Unlike a descriptive study, an experiment is a study in which a treatment, procedure, or program is intentionally introduced and a result or outcome is observed. Experiments can typically answer “why” or “how”. The American Heritage Dictionary of the English Language defines an experiment as a test under controlled conditions that is made to demonstrate a known truth, to examine the validity of a hypothesis, or to determine the efficacy of something previously untried. True experiments have four elements: manipulation, control, random assignment, and random selection.

The most important of these elements are manipulation and control. Manipulation means that something is purposefully changed by the researcher in the environment. Control is used to prevent outside factors from influencing the study outcome. When something is manipulated and controlled and then the outcome happens, it makes us more confident that the manipulation “caused” the outcome. In addition, experiments involve highly controlled and systematic procedures in an effort to minimize error and bias, which also increases our confidence that the manipulation “caused” the outcome.

Another key element of a true experiment is random assignment. Random assignment means that if there are groups or treatments in the experiment, participants are assigned to these groups or treatments, or randomly. This process helps to ensure that the groups or treatments are similar at the beginning of the study so that there is more confidence that the manipulation (group or treatment) “caused” the outcome.

Research studies are designed in a particular way to increase the chances of collecting the information needed to answer a particular question. The information collected during research is only useful if the research design is sound and follows the research protocol.

Carefully following the procedures and techniques outlined in the research protocol will increase the chance that the results of the research will be accurate and meaningful to others. Following the research protocol and thus the design of the study is also important because the results can then be reproduced by other researchers. The more often results are reproduced, the more likely it is that researchers and the public will accept these findings as true. Additionally, the research design must make clear the procedures used to ensure the protection of research subjects, whether human or animal, and to maintain the integrity of the information collected in the study.

4 **Have you found answers to the questions you wrote before reading the text? What are they?**

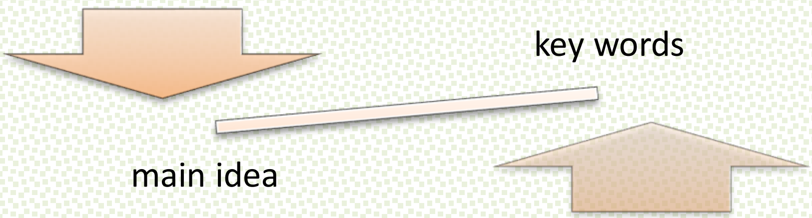
5 **Scan the text and write the number of the paragraph where you can find the following information. Do it as quickly as possible.**

- academic definition of research
- basic characteristics of research
- basic and applied research
- purposes of applied research

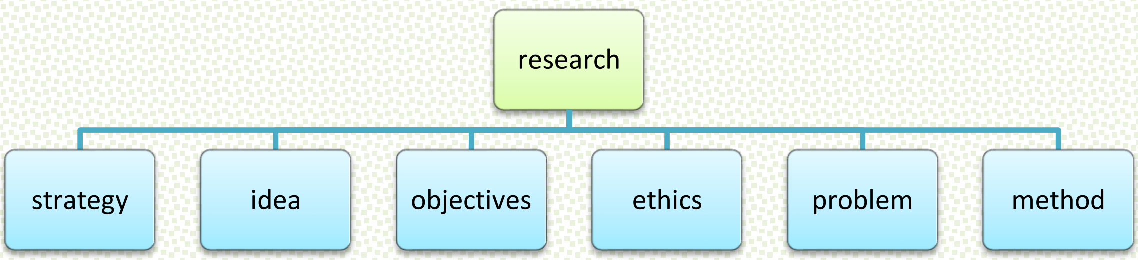
6 **Make a list of the new words which you think will be useful for you in the future. Try to use them in your own sentences. Give:**

- definitions of the words
- indication of whether they are nouns, verbs, adjectives etc.
- phrases in which the word occurs
- other words with the same meaning
- other forms of the words

7 **Define a few key words in your word journal. Write them to remind the main idea of the text.**



8 **Make up word combinations and try to explain what they mean in your own words.**



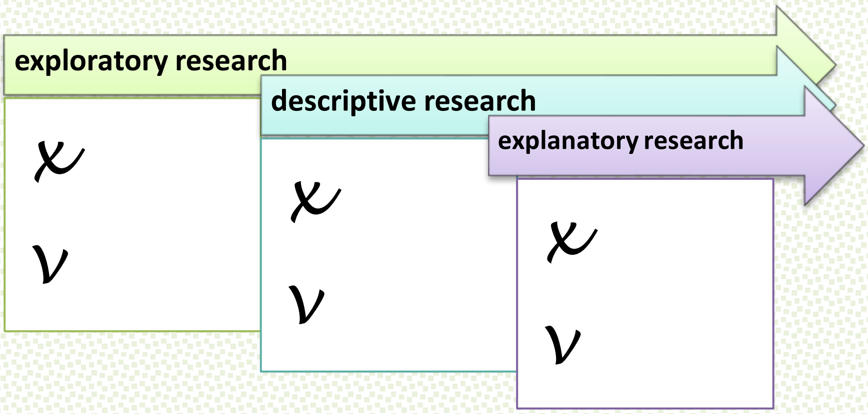
9 **Find the definitions that match the word combinations above.**

ATTENTION: there are the odd definitions.

?	1. A particular way of studying something in order to discover new information about it or understand it better.
?	2. The appropriateness of the researcher's behaviour in relation to the rights of those who become the subject of a research project, or who are affected by it.
?	3. To make a detailed systematic study of something in order to discover new facts.
?	4. General plan of how the researcher will go about answering the research questions.
?	5. The systematic collection and interpretation of information with a clear purpose to find things out.
?	6. An unsettled question; a matter requiring solution
?	7. The work that companies do when they are developing new products, services, or methods.
?	8. Initial idea that may be worked out into a research project.
?	9. Clear, specific statements that identify what the researcher wishes to accomplish as a result of doing research.

10 **Ask questions of the material as you read. Use the questions devised by reporters: *Who, What, When, Where, Why and How*. Discuss them with you partner(s).**

11 **Compare and contrast.**



You can use these words and phrases:

To compare (tell similarities)	To contrast (tell differences)
also // as well as // both // in common // in comparison // like // too // same as // similar // similarly	*as opposed to // but // contrary to // differ // different from // however // on the other hand // unlike // while*

12 **Work in pairs. Discuss with your partner what the key differences between descriptive and experimental research are. Use your list of new words.**

13 **Guess the type of scientific method and complete the table below.**

The purpose	Scientific method
1. to quantify data and generalize results from a sample to the population of interest.	
2. to improve understanding of a particular problem.	
3. to investigate the nature and structure of the existing problems of a company and for modelling and resolving them.	
4. to expand knowledge of processes.	
5. to investigate meanings, interpretations, symbols, and the processes and relations of social life.	
6. to finding solutions to problems encountered in life.	

14 **Prepare a brief talk on research. Discuss the worth mentioning information with your colleagues. Be ready to answer the questions that may follow. Use the mind map.**

Research is ...

There are three main purposes of research ...

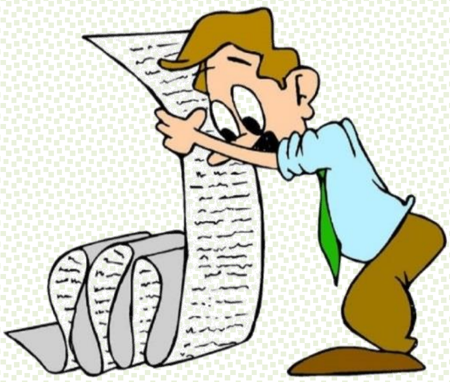
The types of scientific methods are...

There are many kinds of research ...

15 **Comment on the following statements. Supply possible reasons for each your conclusion.**

1. Scientists use multiple research methods (experiments, observations, comparisons, and modeling) to collect evidence.
2. Scientific observations can be made directly with our own senses or may be made indirectly through the use of tools.
3. Researchers often try to generate multiple explanations for what they observe.
4. The process of research involves observation, exploration, testing, communication, and application.
5. Different scientists may interpret the same data in different ways.

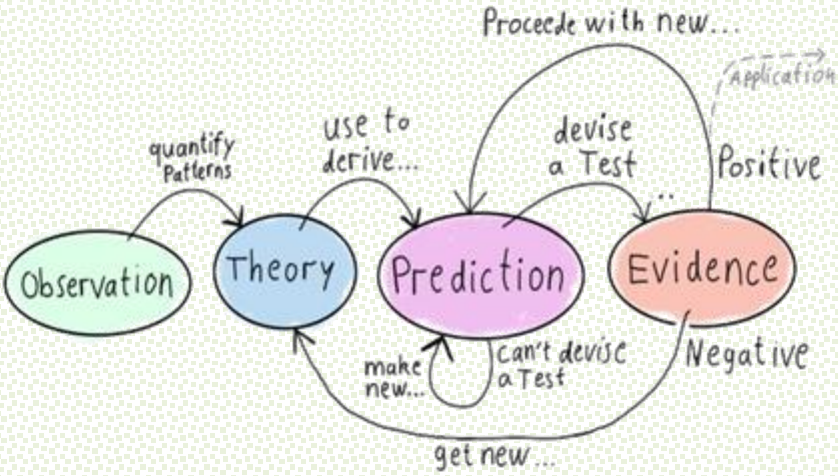
16 **Summarize all the necessary information from the text and write down an expanded summary. Express your attitude to the text. Elicit the information from the text and use additional information from your general knowledge of types of exhibitions or any other source of information.**



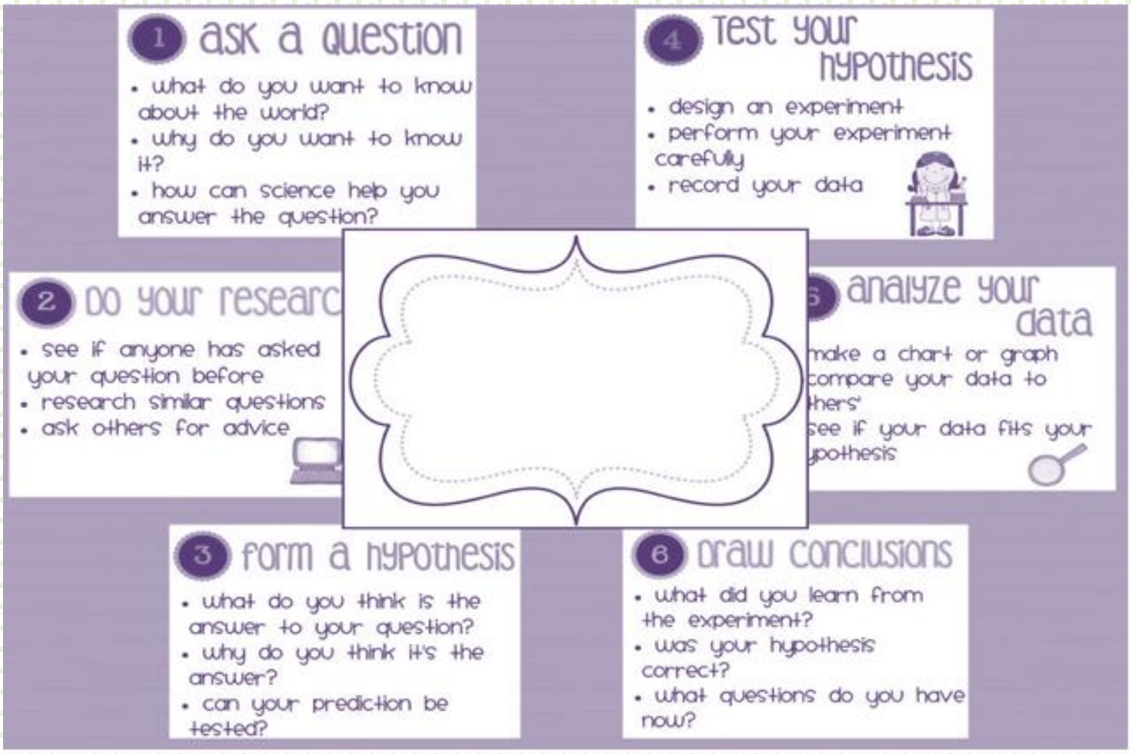
Workshop

17 **Write a process description of your own choice.**

A.



B.



☐ Translate

14 **Make up a written translation of the texts.**

WHAT HAS SCIENCE DONE FOR YOU LATELY?

Plenty. If you think science doesn't matter much to you, think again. Science affects us all, every day of the year, from the moment we wake up, all day long, and through the night. Your digital alarm clock, the weather report, the asphalt you drive on, the bus you ride in, your decision to eat a baked potato instead of fries, your cell phone, the antibiotics that treat your sore throat, the clean water that comes from your faucet, and the light that you turn off at the end of the day have all been brought to you courtesy of science. The modern world would not be modern at all without the understandings and technology enabled by science.

To make it clear how deeply science is interwoven with our lives, just try imagining a day without scientific progress. Just for starters, without modern science, there would be:

no way to use electricity. From Ben Franklin's studies of static and lightning in the 1700s, to Alessandro Volta's first battery, to the key discovery of the relationship between electricity and magnetism, science has steadily built up our understanding of electricity, which today carries our voices over telephone lines, brings entertainment to our televisions, and keeps the lights on.

no plastic. The first completely synthetic plastic was made by a chemist in the early 1900s, and since then, chemistry has developed a wide variety of plastics suited for all sorts of jobs, from blocking bullets to making slicker dental floss.

no modern agriculture. Science has transformed the way we eat today. In the 1940s, biologists began developing high-yield varieties of corn, wheat, and rice, which, when paired with new fertilizers and pesticides developed by chemists, dramatically increased the amount of food that could be harvested from a single field, ushering in the Green Revolution. These science-based technologies triggered striking changes in agriculture, massively increasing the amount of food available to feed the world and simultaneously transforming the economic structure of agricultural practices.

no modern medicine. In the late 1700s, Edward Jenner first convincingly showed that vaccination worked. In the 1800s, scientists and doctors established the theory that many diseases are caused by germs. And in the 1920s, a biologist discovered the first antibiotic. From the eradication of smallpox, to the prevention of nutritional deficiencies, to successful treatments for once deadly infections, the impact of modern medicine on global health has been powerful. In fact, without science, many people alive today would have instead died of diseases that are now easily treated.

Scientific knowledge can improve the quality of life at many different levels — from the routine workings of our everyday lives to global issues. Science informs public policy and personal decisions on energy, conservation, agriculture, health, transportation, communication, defense, economics, leisure, and exploration. It's almost impossible to overstate how many aspects of modern life are impacted by scientific knowledge.

HOW FIRE WAS DISCOVERED

The very earliest men knew about fire. It flashed at them from volcanoes, in lightning and in forest fires. At first men knew fire only to fear it. Then they found that fire could be useful and to a certain extent kept under control. It is thought that each group of people made this great discovery for themselves.

Early man used fire for cooking and to harden his weapons. Yet it was long, long years before men learned to get a fire for themselves. The precious fire was guarded, watched and fed constantly. When camp was moved the fire was carefully carried to the new place. For if it went out, they had to wait for a forest fire, or for a lightning to strike some tree. Or maybe they had to get it from another tribe they happened to meet.

So we cannot give credit for discovering the use of fire to anyone. We can only guess how it happened. Some think that lightning set fire to a dead tree and from that man learned about fire. Or probably he saw fire started by the rubbing together of two branches of a tree and then tried to imitate this process himself. Later man came to know the benefits of fire. Certainly, if man had to live his long history over again, no doubt he would have learned to use fire in just the same way.

§ 4

HOW SCIENTISTS WORK

☐ ***Read***

☐ ***Write***

☐ ***Speak***

1 **Skim the text about scientists' work. Find an appropriate heading for each paragraph.**

- Data collection and analysis
- Formulating a hypothesis
- The meaning of the word "scientist"
- How scientists work

1____

The word *scientist* is a general term, used to describe someone who systematically researches various aspects of the physical world, making a hypothesis and testing it in order to gain and share a better understanding of how things work and function. Not all scientists wear white coats and work in labs. There are a wide variety of jobs and careers that require knowledge and application of science, from research to business and from regulation to teaching. Each scientist, however, follows 'the scientific method', which is a strict set of rules that ensure all new discoveries are factual and not just speculation.

2____

Scientific research can be divided into basic science, also known as pure science, and applied science. In basic science, scientists working primarily at academic institutions pursue research simply to satisfy the thirst for knowledge. In applied science, scientists at industrial corporations conduct research to achieve some kind of practical or profitable gain. However, the division between basic and applied science is not always clearcut. This is because discoveries that initially seem to have no practical use often develop as time goes by. Scientists work in every field imaginable. In each of these varied investigations the questions asked and the means employed to find answers are different. All the inquiries, however, share a common approach to problem solving known as the scientific method. Scientists may work alone or they may collaborate with other scientists. In all cases, a scientist's work must measure up to the standards of the scientific community. Scientists submit their findings to science forums, such as science journals and conferences, in order to subject the findings to the scrutiny of their peers.

3____

During an experiment, scientists typically make measurements and collect results as they work. This information, known as data, can take many forms. Data may be a set of numbers, such as daily measurements of the temperature in a particular location or a description of side effects in an animal that has been given an experimental drug. Scientists typically use computers to arrange data in ways that make the information easier to understand and analyze. Data may be arranged into a diagram such as a graph that shows how one quantity (body temperature, for instance) varies in relation to another quantity (days since starting a drug treatment). Scientists use mathematics to analyze the data and help them interpret their results. The types of mathematics used include statistics, which is the analysis of numerical data, and probability, which calculates the likelihood that any particular event will occur.

4____

Once an experiment has been carried out and data collected and analyzed, scientists look for whatever pattern their results produce and try to formulate a hypothesis that explains all the facts observed in an experiment. In developing a hypothesis, scientists employ methods of induction to generalize from the results of their experiment to predict future outcomes, and deduction to infer new facts from experimental results. Formulating a hypothesis may be difficult for scientists because there may not be enough information provided by a single experiment, or the experiment's conclusion may not fit old theories. Sometimes scientists do not have any prior idea of a hypothesis before they start their investigations, but often scientists start out with a working hypothesis that will be proved or disproved by the results of the experiment. Scientific hypotheses can be useful. But they can also be problematic because they tempt scientists, either deliberately or unconsciously, to favor data that support their ideas. Scientists generally take great care to avoid bias, but it remains an ever-present threat. If a hypothesis is borne out by repeated experiments, it becomes a theory i.e. an explanation that seems to consistently fit with the facts. The ability to predict new facts or events is a key test of a scientific theory.

2 Read the text again and write down any new or difficult words. Look these words up in a dictionary and try to use them in the sentences of your own.

3 Work in groups. Write the questions devised by reporters: Who, What, When, Where, Why and How. Ask your partner the questions you wrote to probe the content of the text.

4 Tick if the following statements are true (T) or false (F). Correct the false ones. Give arguments using the information from the text.

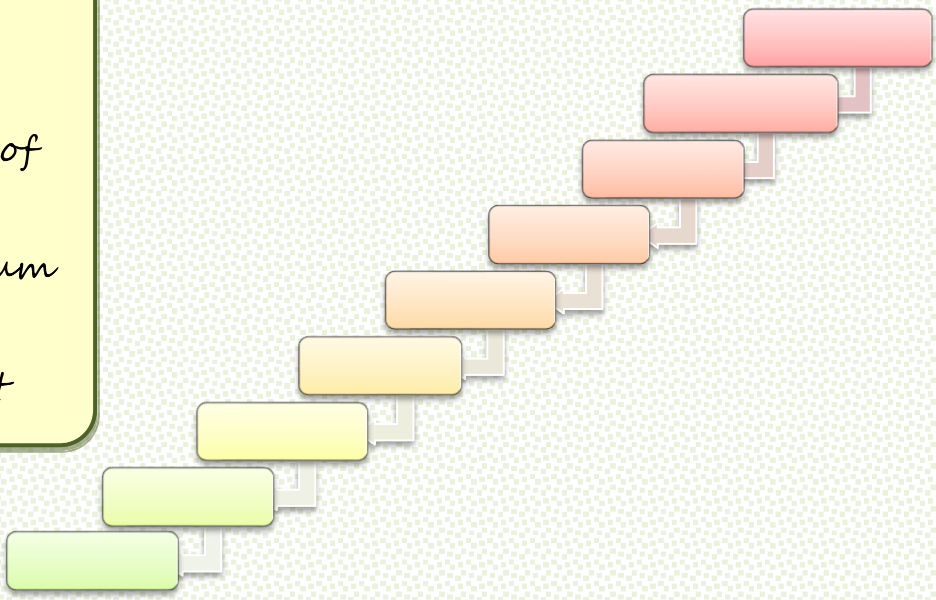
?	T	F
1. A scientist is someone who has studied science and whose job is to teach or wear white coats and work in labs.		
2. There are two branches of scientific research i. e. pure science and applied science.		
3. The division between basic and applied science is not always definit.		
4. A scientist's work must indispose to the standards of the scientific community.		
5. Data collecting is an essential part of any scientific research.		
6. The method of induction is the only way for a scientist to develop a hypothesis.		
7. Formulating a hypothesis is not an easy task.		
8. Scientists generally tend to avoid bias.		

5 Work in small groups and discuss the following:

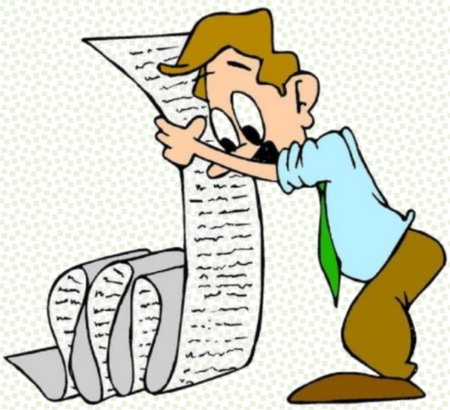
1. Scientists seek ultimate truth, but can only determine the most likely causes of observations based on current and past experiences.
2. Scientists work in every field imaginable.
3. Data can take many forms.
4. Scientific hypotheses can be both useful and problematic.

6 **Fill in a logical chain using the following key-words.**

hypothesis
scientific method
scientist
data
application of science
scientific forum
research
experiment



7 **Summarize the information from the text in writing and get ready to speak about the work of the scientist. Make use of the logical chain from the previous exercise.**

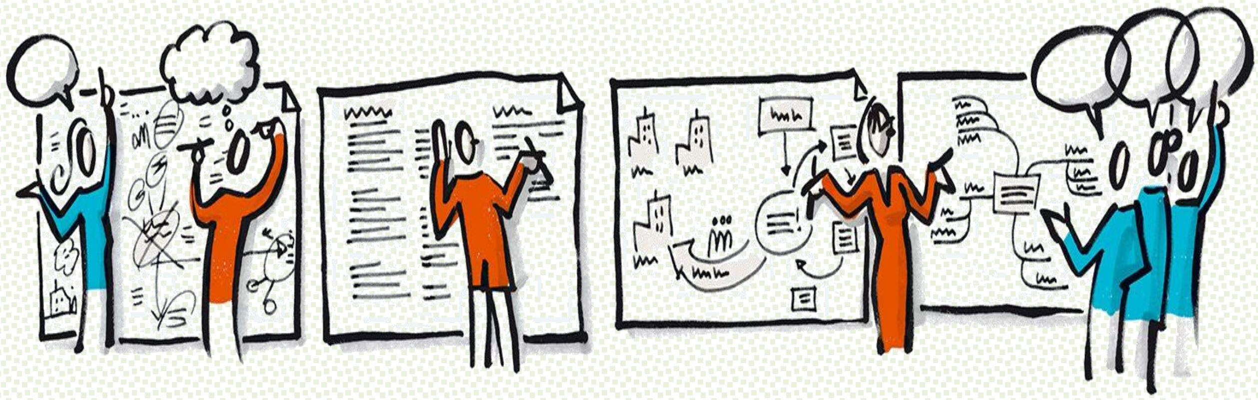


Workshop

8 **Write a process description of your own choice.**

A.

B.



☐ Translate

9 **Make up a written translation of the text.**

SCIENTIFIC THINKING

You might imagine that scientific thinking differs from the sorts of reasoning tools that you use in your everyday life – that scientists go around with a head full of equations through which they view the world. In fact, many aspects of scientific thinking are just extensions of the way you probably think everyday:

Ever seen something surprising and tried to figure out how it happened? Perhaps you’ve seen a magician make his assistant disappear from a box and wondered if the trick involved a trap door. Ever sought out more evidence (e.g., by looking for a joint in the floor beneath the box)? Ever come up with a new explanation for a mystery? Perhaps the trick used a mirror to reflect an image of an empty wall ….

These might seem like trivial examples, but in fact, they represent scientific habits of mind applied to an everyday situation. Scientists use such ways of thinking to scrutinize their topics of study – whether that’s human behavior or neutron stars – and you can use the same tools in your own life.

Want to develop your scientific outlook? Try to consciously apply these habits of mind to the natural world around you:

Question what you observe. How does bleach lighten your clothes? How do bees find their way back to the hive? What causes the phases of the moon?

Investigate further. Find out what is already known about your observations. Your sister says that bleach washes chemicals out of fabric, while your chemistry book says that bleach is good at breaking molecular bonds that cause chemicals to appear colored.

Be skeptical. You've heard that honeybees use the sun to navigate, but does that really make sense? What would they do on cloudy days?

Try to refute your own ideas. Look at things from the other side of the argument. You'd always assumed that the phases of the moon were caused by the shadow of the Earth falling on the moon but if that were really the case, then how is it that we can sometimes see both the moon and the sun in the sky overhead?

Seek out more evidence. Does bleach work better on some sorts of stains than others? Do bees leave the hive on cloudy days? Is there any relationship between the phase of the moon and where it appears in the night sky?

Be open-minded. Change your mind if the evidence warrants it. If everything you learn about the moon clashes with the idea of lunar phases being caused by the Earth's shadow, perhaps you should give up that idea and look for other explanations.

Think creatively. Try to come up with alternate explanations for what you observe. Maybe bees also use landmarks to get back to their hives, maybe they use the Earth's magnetic field, maybe they follow some sort of scent trail, or maybe they use a combination of navigation methods ….

In terms of answering your original questions, some of these strategies are bound to be dead ends. At the end of the day, you'll have learned a lot but may still be without solid answers. And if so, congratulations – you're really thinking like a scientist! Scientific investigations, like your own exploration, often lead in unexpected directions and lack tidy endpoints. Nevertheless, these ways of thinking illuminate the world around us in ways that are often useful and always fascinating, revealing the inner workings of our everyday experiences – whether that's a walk past a garden, a moonlit night, or just doing a load of laundry.

THE SPARK FOR SCIENCE

Eureka!" or "aha!" moments may not happen frequently, but they are often experiences that drive science and scientists. For a scientist, every day holds the possibility of discovery – of coming up with a brand-new idea or of observing something that no one has ever seen before. Vast bodies of knowledge have yet to be built and many of the most basic questions about the universe have yet to be answered:
What causes gravity?
How do tectonic plates move around on Earth's surface?
How do our brains store memories?
How do water molecules interact with each other?

We don't know the complete answers to these and an overwhelming number of other questions, but the prospect of answering them beckons science forward.

Discoveries, new questions, and new ideas are what keep scientists going and awake at night, but they are only one part of the picture; the rest involves a lot of hard (and sometimes tedious) work. In science, discoveries and ideas must be verified by multiple lines of evidence and then integrated into the rest of science, a process which can take many years. And often, discoveries are not bolts from the blue. A discovery may itself be the result of many years of work on a particular problem.

The process of scientific discovery is not limited to professional scientists working in labs. The everyday experience of deducing that your car won't start because of a bad fuel pump, or of figuring out that the centipedes in your backyard prefer shady rocks shares fundamental similarities with classically scientific discoveries like working out DNA's double helix. These activities all involve making observations and analyzing evidence – and they all provide the satisfaction of finding an answer that makes sense of all the facts. In fact, some psychologists argue that the way individual humans learn (especially as children) bears a lot of similarity to the progress of science: both involve making observations, considering evidence, testing ideas, and holding on to those that work.

RUTHERFORD AND THE ATOM

Ernest Rutherford's investigations were aimed at understanding a small, but illuminating, corner of the natural world: the atom. He investigated this world using alpha particles, which are helium atoms stripped of their electrons. Rutherford had found that when a beam of these tiny, positively-charged alpha particles is fired through gold foil, the particles don't stay on their beeline course, but are deflected (or "scattered") at different angles. Rutherford wanted to figure out what this might tell him about the layout of an atom.

Ernest Rutherford's lab tested the idea that an atom's positive mass is spread out diffusely by firing an alpha particle beam through a piece of gold foil, but the evidence resulting from that experiment was a complete surprise: most of the alpha particles passed through the gold foil without changing direction much as expected, but some of the alpha particles came bouncing back in the opposite direction, as though they had struck something dense and solid in the gold foil. If the gold atoms were really like loosely packed snowballs, all of the alpha particles should have passed through the foil, but they did not!

The deflection of alpha particles shows that the positive charge of atoms is concentrated in a dense mass. From this evidence, Rutherford concluded that their snowball model of the atom had been incorrect, even though it was popular with many other scientists. Instead, the evidence suggested that an atom is mostly empty space and that its positive charge is concentrated in a dense mass at its core, forming a nucleus. When the positively charged alpha particles were fired at the gold foil, most of them passed through the empty space of the gold atoms with little deflection, but a few of them ran smack into the dense, positively charged nucleus of a gold atom and were repelled straight back (like what would happen if you tried to make the north poles of two strong magnets touch). The idea that atoms have positively charged nuclei was also testable. Many independent experiments were performed by other researchers to see if the idea fit with other experimental results.

§ 5

INTERNATIONAL COOPERATION

☐ ***Read***

☐ ***Speak***

☐ ***Write***

1 **Establish your purpose for reading: narrative = for literary experience / enjoyment; expository = for information; functional = to perform tasks / follow directions; educational = to improve reading skills, etc.**

2 **Preview the text to get an idea of what it is about without reading the main body of the text.**

3 **Predict the contents of the text and write questions about it.**

QUESTIONS BEFORE READING

Predictions

1.____?
2.____?
3.____?
4.____?
5.____?

Part I

1. Science is global in nature and science-based approaches make tangible improvements in people's lives. Science and the liberal arts can offer solutions to social issues that they can help exploit opportunities and that society in general can benefit from sharing knowledge. The academic endeavour has been a global activity for centuries, with researchers collaborating internationally in order to broaden and deepen their knowledge and scope. Sound science is a critical foundation for sound policy making and ensures that the international community develops reliable

international benchmarks. International cooperation is a universal mode of interaction between two or more countries based on sharing research results, production, commerce, protection of investments, and industrial know-how.

2. International cooperation is essential if we are to find solutions to global issues like climate change and combating emerging infectious diseases. International scientific cooperation promotes good will, strengthens political relationships, helps foster democracy and civil society, and advances the frontiers of knowledge for the benefit of all. A number of worldwide developments foster international scientific cooperation, in particular globalization and the rise of scientific networks that cross borders. It ranges from the digital exchange of data, information and knowledge to the joint establishment of laboratories and research infrastructures. The number one reason for international scientific cooperation is an intrinsic one: to increase the quality of science. This goes for scientific research as well as for academic instruction. But extrinsic aspects of international scientific collaboration are just as important. Global issues, challenges and opportunities in science, society and the economy demand it. The complexity of many of these conditions calls for a multidisciplinary international scientific approach. In other words, international scientific cooperation does not only improve the quality of research itself but also the quality of its utilization and effects. It is important, it is needed, and, fortunately, it is increasing.

3. The disadvantages of international scientific cooperation are related to two main risks: impairment of scientific quality and misuse of scientific knowledge. With increasing international cooperation, the likelihood of scientific cooperation with repressive or dubious regimes may also increase.

Arguments in favour of or against international scientific cooperation are contingent on the specific circumstances. It is necessary to have sufficient information to make informed decisions, but often it is not readily available.

Part II

4. The framework of international cooperation has three separate dimensions.

Dimension 1: The scope of scientific cooperation. The scope of scientific cooperation can take place at individual, institutional and national levels.

At the individual level, cooperation takes place between individual scientists and scholars. It also includes exchanges of individual students. It can take place in the Netherlands, in the country where the cooperation partner is located, in yet another country, or remotely via electronic networks.

At the institutional level, cooperation takes place between organizations. Arrangements concerning student or researcher exchanges are set out in contracts or agreements. Scientific institutions, such as universities and research institutes, can participate in research projects in their own country or abroad.

At the national level, public authorities or national organizations enter into bilateral or multilateral cooperation agreements that allow for large-scale institutional and individual cooperation. National parties can also participate in international research projects, including joint laboratories. Another type of cooperation at the national level involves scientific cooperation as part of development aid.

5. Dimension 2: The nature of the regime of the collaborating partner. The term ‘regime’ refers to ‘administration’ in the general sense. It therefore covers not only national administrations but also administrators at local level and administrators of scientific organizations. Repressive or dubious regimes may be of three levels:

Restriction of scientific freedom concerns regimes that restrict the freedom of scientific practice or that do not comply with the requirements of scientific integrity, independence and objectivity. Motives are often political and sometimes commercial. In some cases, such curtailment affects the personal safety of researchers and those close to them.

Violation of human rights concerns regimes that violate human rights. The issue is whether an individual, organization or country legitimizes such violations through cooperation.

Military threat and political conflict concern hostile regimes or regimes that represent a political or military threat. Such regimes aim to acquire knowledge and materials through scientific espionage for hostile or evil purposes. They frequently have military and strategic objectives, making them a threat to national and international security.

These three types of repressive regimes may overlap to a certain extent. Those engaged in political conflict may also be guilty of curtailing scientific freedom or violating human rights.

6. Dimension 3: The impact of undesired effects. ‘Impact’ is defined here as the potential harmful effects of misuse of scientific knowledge and discoveries. Three levels of impact are distinguished: low, moderate and high.

The content of the relevant scientific research at a low level is largely neutral, harmless, and nonpolitical. In such cases, there is little harm in cooperating with scientists from countries with repressive regimes. It is necessary to be careful, however, that research is not used as a cover for subversive activities. At this level misuse may even be unintentional.

Moderate level means that some research topics may be of a sensitive nature, for example research on violations of human rights or on political conflicts. The research may also be interesting for certain parties, for example foreign intelligence services or businesses.

High level of the content of the relevant scientific research involves one special category i.e. research that poses a serious threat to national and/or international security when it falls into the wrong hands. It can be characterised as ‘dual use research of concern'. Such knowledge can be used for both good and bad ends – for example for military purposes – and is crucial. The most serious impact concerns research that can be used to construct weapons, in particular weapons of mass destruction.

7. The analytical framework may provide some assistance to governments, institutions and researchers in objectifying and weighing the advantages and disadvantages of such cooperation in the concrete situations they are confronted with. Identifying three distinctive levels in three separate dimensions (scope, regime and impact) may bring some clarity and order to the complex challenge of assessing the risks of international scientific collaboration.

Sufficient information is necessary to make informed decisions, but often it is not readily available. The analytical framework may help to identify what kind of information should be sought. When in doubt about the trustworthiness of a cooperation partner, for example, it is better to get to know that partner gradually so that information can be acquired and trust can be built up. Another way of getting acquainted with the prospective foreign partner is to consult the national network of foreign scholars and students, or to ask other researchers about their experiences with organizations, authorities and universities from that particular country.

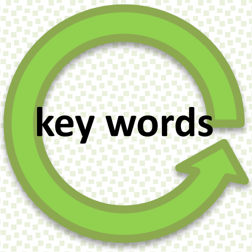
8. Trustworthiness and integrity can also be promoted by requesting the prospective partner to confirm in writing that they will comply with a code of conduct on responsible science. This will make clear in advance what their commitment is to responsible research conduct and proper scientific practice. Partners in scientific collaboration should use a Code of Conduct for Scientific Practice so that institutional and individual responsibilities regarding the assessment of the risks of international scientific cooperation are made explicit.

4 **Have you found the answers to the questions you wrote before reading the text? What are they?**

5 **Make a list of the new words which you think will be useful for you in the future. Try to use them in your own sentences. Give:**

- definitions of the words
- indication of whether they are nouns, verbs, adjectives etc.
- phrases in which the word occurs
- other words with the same meaning
- other forms of the words

6 Define a few key words in your word journal. Recommend your partner to practise them in his/her own sentences.



•?__________

•?__________

•?__________

•?__________

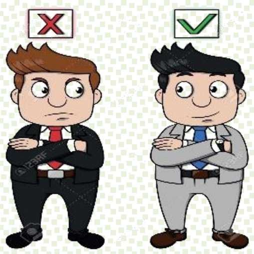
•?__________

7 Read the text again and fill in the table below. Compare your results with your partner.

Paragraph of the text	✔ I know	+ New information	- I think differently	? Need to learn more	! Controversial point
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					

8 Work in groups. Write the questions devised by reporters: *Who, What, When, Where, Why and How*. Ask your partner the questions you wrote to probe the content of the text.

9 Read the following statements. Do you agree with them? Give arguments using the information from the text.



1. The academic endeavour has been a global activity for centuries.
2. The academic endeavour is a universal mode of interaction between two or more countries.
3. Globalization and the rise of scientific networks foster international scientific cooperation.

4. One of the most important reasons for international scientific cooperation is to increase the quality of science.
5. International scientific cooperation is necessary to improve only the quality of research itself.
6. impairment of scientific quality and misuse of scientific knowledge are some of the advantages of international scientific cooperation.
7. International cooperation framework has three interwoven dimensions.
8. Scientific cooperation takes place at institutional and national levels.
9. Universities and research institutes can participate in research projects in their own country or abroad.
10. Motives concerning restriction of scientific freedom are often political and sometimes commercial.
11. Three levels of impact of undesired effects are individual, institutional and national.
12. The analytical framework may provide some assistance to governments, institutions and researchers.
13. Sometimes it is not possible to get sufficient information.
14. Scope, regime and impact may bring some clarity and order to the complex challenge of assessing the risks of international scientific collaboration.
15. Code of Conduct for Scientific Practice helps understand institutional and individual responsibilities regarding the assessment of the risks of international scientific cooperation.

10 **Fill in the chart and get ready to speak about advantages and disadvantages of international cooperation. Use the text for reference.**

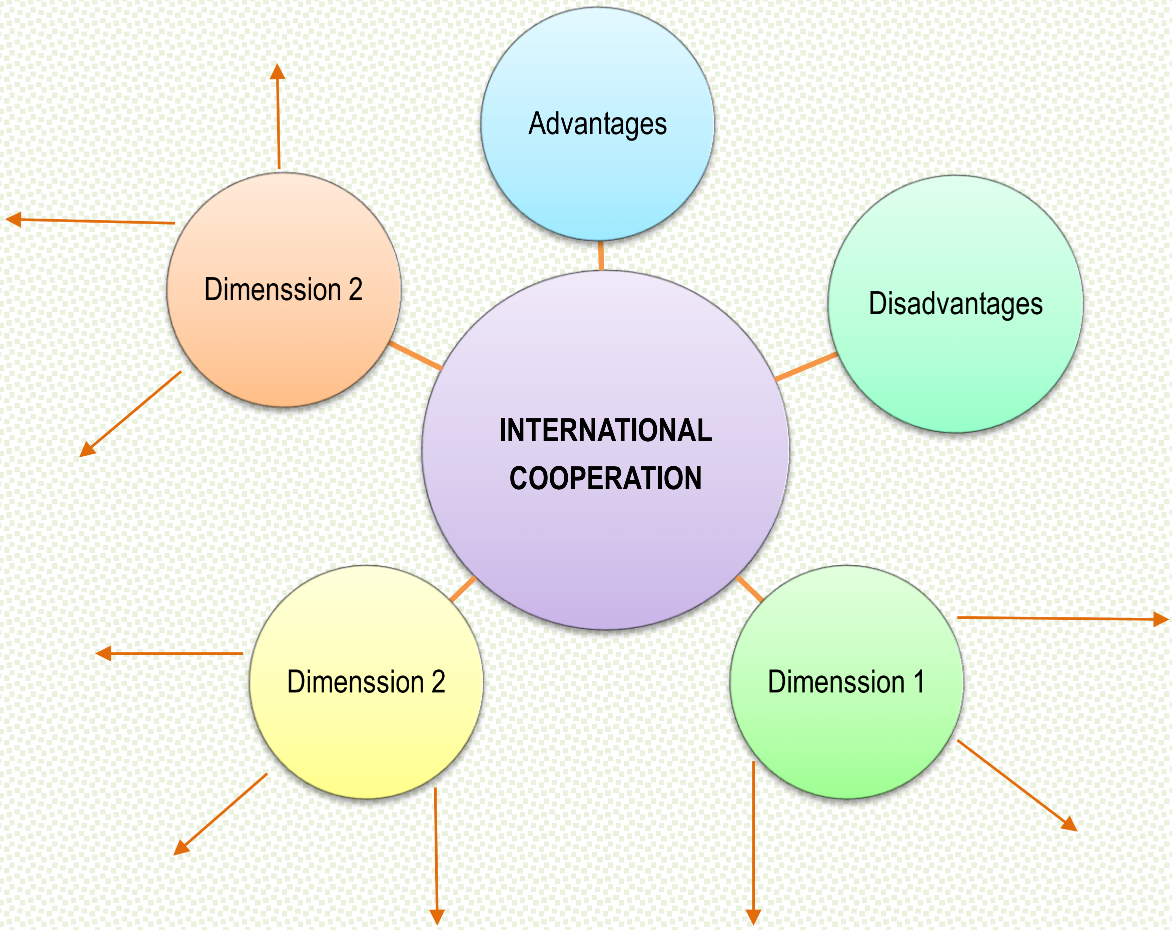
ADVANTAGES

- ...
- ...
- ...
- ...

DISADVANTAGES

- ...
- ...
- ...

11 **Fill in the mind map and summarize the information from the text in writing. Get ready to speak about international cooperation. Express your attitude to the text.**



12 **Study the goals of international scientific cooperation. Express your attitude.**

- Avoid in-breeding
- Improe the visibility of a country's research groups abroad
- Establish new research partnerships
- Participation in the international scientic programs
- Bilaterial contracts on cooperation with foreign scientific institutions
- Participation in international events (congresses, conferences, etc.)
- Promote academic mobility

☐ Translate

13 **Make up a written translation of the text.**

DRIVERS AND BARRIERS FOR THE INTERNATIONALISATION OF SCIENCE

The on-going globalization and internationalization of Science, Technology and Innovation (STI) is affected by a number of drivers and barriers. These are different for industry and innovation compared with general science. Several factors drive the increasing globalisation of science:

• The globalisation of the world economy drives firms to increasingly access scientific sources outside their local boundaries.

• Students and researchers are increasingly mobile. As a consequence, scientific institutions and firms are ever more competing for talent in a global labour market. The ICT and the Internet revolution have reduced the cost of international communication and boosted international exchange in science. These trends are amplified by the growth in transport systems and reductions in real transport costs of the last few decades.

• ICT and internet have also fostered new ways of gathering knowledge, leading to innovative international knowledge transfer models in the fields of fundamental research. Examples such as the Milky Way Project or the Artigo Project build up databases with tremendous scientific gain.

• The research agenda is increasingly being made up of issues that have a global dimension, such as climate change, energy, safety, pandemics.

• Policy makers are increasingly focusing attention on international Science and Technology (S&T) cooperation and funding programmes to stimulate internationalisation of higher education and research. This includes many governments from emerging economies, who have come to view S&T as integral to economic growth and development. To that end, they have taken steps to develop their S&T infrastructures and expand their higher education systems. This has brought a great expansion of the world's S&T activities and a shift toward developing Asia, where most of the rapid growth has occurred.

• Costs of and access to infrastructure lead to stronger incentives to cooperate and share resources across boundaries.

• Increased specialisation of knowledge production globally makes excellence being located more diversely and makes it vital to seek advanced knowledge where it is.

• Scientific knowledge is produced with greater "speed" and impact, creating incentives to avoid duplication.

Nevertheless, also within science there are still forces counterbalancing the globalisation, such as the resilience of the national dimension in education, science and technology policy and public funding, proximity effects in the exchanges of tacit knowledge requiring face-toface interactions; cultural and language barriers, and the inertia of personal and institutional networks

COOPERATION IN A COUNTRY WITH A REPRESSIVE REGIM

There are various arguments for and against scientific cooperation in a country or organisation with a repressive regime. One argument in favour of such cooperation is that the context of restricted scientific freedom o

The counterargument is that such a context may in itself be a constraining factor. A regime may consider certain topics to be so sensitive that it deliberately makes research unfeasible. It may be impossible to get access to important sources or to publish through channels other than the official ones. The undesirable consequence may be censorship or self-censorship. There is also the question of personal safety. Individual researchers who carry out research in countries with repressive regimes are themselves usually relatively safe. That does not apply, however, to everybody involved in such a study, in particular critical local researchers or respondents. Their involvement in the research may put them at risk. It is important to recognise these dangers at an early stage and take them into account when considering whether or not to cooperate. Espionage is not limited to intelligence officers seeking and acquiring information. There is also a realistic risk that collaborative researchers will be kept under surveillance. what appear to be ‘accidental’ meetings should therefore be treated with suspicion. Depending on the precise nature of the regime and the field in which they work, researchers should bear in mind that computer files are not secure, particularly if they are not properly protected, locked or stored. Cybercrime is a serious threat if digitally stored information is not kept secure. Customs checks may be a cover for copying data. Cybercrime can of course also occur in a researcher’s own country.

§ 6

THE SCIENTIFIC COMMUNITY

☐ ***Read***

☐ ***Write***

☐ ***Speak***

1 **Skim the text. Create the "big picture" or main idea of the text.**

2 **Read the text and make up a word journal. Write down any new or difficult words. Look these words up in a dictionary and try to use them in a sentence or explain what they mean in your own words.**

People from all over the world from all sorts of different cultures and backgrounds are a part of the scientific community. Science depends on its community in many ways: from the specific (e.g., catching a mistake in an article) to the general (e.g., dividing up the enormous amount of work that keeps science moving forward). The scientific community is a diverse network of interacting scientists, researchers, students, lab technicians, the people who work at scientific journals, employees at funding agencies — in short, anyone who helps science govern itself and move forward.

Interactions within the scientific community are essential components of the process of science. Scientists don't work in isolation. Though they sometimes work alone, scientists are just as likely to be found emailing colleagues, arguing with other scientists over coffee, sitting in on a lab meeting, or preparing conference presentations and journal articles. In science, even those few working entirely on their own must ultimately share their work for it to become part of the lasting body of scientific knowledge.

Scientists from diverse backgrounds bring many points of view to bear on scientific problems and science benefits from such diversity as diversity facilitates specialization, invigorates problem solving and balances biases. Despite their diversity, all of those individual scientists are part of the same scientific community and contribute to the scientific enterprise in valuable ways.

Membership in the scientific community is generally, but not exclusively, a function of education, employment status, research activity and institutional affiliation. Status within the community is highly correlated with publication record, and also depends on the status within the institution and the status of the institution. Researchers can hold roles of different degrees of influence inside the scientific community. Researchers of a stronger influence can act as mentors for early career researchers and steer the direction of research in the community like agenda setters. Interactions within the scientific community and the scrutiny they entail take time and can slow the process of science. However, these interactions are crucial because they help ensure that science provides us with more and more accurate and useful descriptions of how the world works.

Members of the same community do not need to work together. Communication between the members is established by disseminating research work and hypotheses through articles in peer reviewed journals, or by attending conferences where new research is presented and ideas exchanged and discussed. There are also many informal methods of communication of scientific work and results as well. And many in a coherent community may actually not communicate all of their work with one another, for various professional reasons.

Functions served by the community are the following:

Inspiration. Community-level interactions encourage innovation and spark ideas about new lines of evidence, new applications, new questions, and alternate explanations. For example, James Watson and Francis Crick came up with a new and brilliant idea for the structure of DNA, but that idea did not come out of the blue. The idea was sparked by evidence that many other scientists (including Linus Pauling, Erwin Chargaff, Maurice Wilkins, and especially Rosalind Franklin) discovered and made available to the scientific community prior to the Watson/Crick model

Motivation. Some people are driven by the thrill of competition and scientists are no exception. Some scientists are motivated by the sense of competition offered by the community. The scientific community offers the prospects of recognition, esteem, and a scientific legacy — payoffs which help motivate many scientists in their investigations.

The community offers scientists the prospect of *recognition* from their peers. In science, achievement is usually measured, not in terms of money or titles, but in terms of respect and esteem from colleagues. In science, both competition and recognition from the community encourage going out on a limb, testing a new idea, creative thinking, and plain old hard work.

Division of labor. Science is simply too broad for an individual on his or her own to handle! Even research within a single narrow field may cover an immense array of specialized topics, from the chemical details of decoding DNA to cellular communication. That specialized knowledge is divided up among different researchers, who may then share their expertise by working together. Collaborations and division of labor are increasingly important today, as our scientific understanding, techniques, and technologies expand. There's simply more to know than ever before! And as we learn more about the world, more research is performed at the intersections of different fields: chemical reactions within cellular organelles, the mathematics of protein folding, the interplay between Earth's geologic history and biological evolution, or the physics of snail locomotion. Such cross-disciplinary studies are better approached by a team of experts from different fields than by a single individual struggling to keep up-to-date with too many topics.

Evaluation of evidence and ideas. The scrutiny of the scientific community helps ensure that evidence meets high standards of quality, that all relevant lines of evidence are explored, and that judgments are not based on flawed reasoning.

Generation of new ideas. Interactions within a diverse and creative community spark ideas about new lines of evidence, new interpretations of existing data, new applications, new questions, and alternate explanations — all of which help science move forward.

Elimination of bias and fraud by keeping watchful eye. Though fraud is rare and bias often unintentional, the occasional cases of such offenses are detected through the scrutiny and ongoing work of the scientific community.

Scrutiny. Participating in the scientific community involves scrutinizing the work of others and allowing your own work to be similarly evaluated by your peers. This system of checks and balances verifies the quality of scientific research and assures that evidence is evaluated fairly.

Through the action of the scientific community, science is self-correcting. It includes many "sub-communities" working on particular scientific fields, and within particular institutions; interdisciplinary and cross-institutional activities are also significant. Objectivity is expected to be achieved by the scientific method. Peer review, through discussion and debate within journals and conferences, assists in this objectivity by maintaining the quality of research methodology and interpretation of results.

3 **Work in groups. Write the questions devised by reporters: Who, What, When, Where, Why and How. Ask your partner the questions you wrote to probe the content of the text.**

4 **Read the following statements. Do you agree with them? Give arguments using the information from the text.**

1. Science depends on its community in many ways.

2. Scientists don't work in isolation.
3. Researchers can hold roles of different degrees of influence inside the scientific community.
4. Members of the same community do not need to work together.
5. Collaborations and division of labor among different researchers are increasingly important today.
6. Participating in the scientific community involves scrutinizing the work of others.
7. Science depends on diversity.

5 **Match the sentences in A to their interpretations in B. Exresss your attitude towards the information you read.**

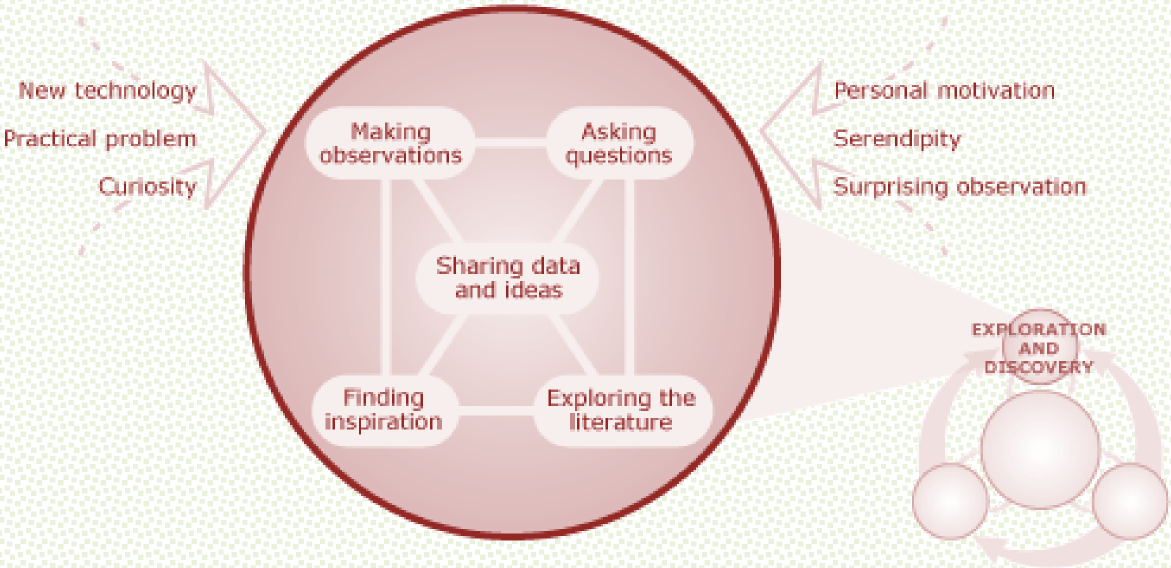
A		B
1. Diversity facilitates specialization		a. Science benefits greatly from a community that approaches problems in a variety of creative ways. A diverse community is better able to generate new research methods, explanations, and ideas, which can help science over challenging hurdles and shed new light on problems.
2. Diversity invigorates problem solving		b. Science benefits from practitioners with diverse beliefs, backgrounds, and values to balance out the biases that might occur if science were practiced by a narrow subset of humanity. Scientists strive to be fair and objective in their assessments of scientific issues, but in those occasional cases in which personal biases sneak in, they are kept in check by a diverse scientific community.
3. Diversity balances biases		c. Scientists have different strengths and different interests. Not only do people from different backgrounds choose to investigate different questions, but they may approach the same question in different ways. While each might choose to tackle the same topic (say, human cognition), they will do so from different angles, contributing to a more complete understanding of the topic.

7 **Summarize the information from the text in writing and get ready to speak about a scientific community. Use the mindmap given below.**

Workshop

17 **Write a process description of your own choice.**

A.



B.

☐ *Translate*

13 **Make up a written translation of the text.**

The American Assotiation for the Advancement of Science (AAAS) seeks to "advance science, engineering, and innovation throughout the world for the benefit of all people." To fulfill this mission, the AAAS Board has set the following broad goals:

- Enhance communication among scientists, engineers, and the public;
- Promote and defend the integrity of science and its use;
- Strengthen support for the science and technology enterprise;
- Provide a voice for science on societal issues;
- Promote the responsible use of science in public policy;
- Strengthen and diversify the science and technology workforce;
- Foster education in science and technology for everyone;
- Increase public engagement with science and technology; and
- Advance international cooperation in science.

The world's largest multidisciplinary scientific society and a leading publisher of cutting-edge research through its Science family of journals, AAAS has individual members in more than 91 countries around the globe. Membership is open to anyone who shares our goals and belief that science, technology, engineering, and mathematics can help solve many of the challenges the world faces today. You can lend your support to our efforts on behalf of scientists, engineers, educators, and students everywhere by becoming a member.

The formation of AAAS in 1848 marked the emergence of a national scientific community in the United States. While science was part of the American scene from the nation's early days, its practitioners remained few in number and scattered geographically and among disciplines. AAAS was the first permanent organization formed to promote the development of science and engineering at the national level and to represent the interests of all its disciplines.

Participants in AAAS meetings, held in cities across the country, represented a who's who of science. The meetings were covered widely by newspapers, which sometimes reprinted their proceedings verbatim.

However, AAAS's permanence was not preordained and, despite the many contributions it made during its first 50 years, the Association came close to extinction more than once. Ultimately, an alliance with Science magazine, which had failed as a private venture, rejuvenated both the magazine and AAAS.

ENGLISH DICTIONARY

§ 7

KNOWLEDGE TRANSFER: GENERAL INFORMATION

☐ ***Read***

☐ ***Speak***

☐ ***Write***

1 **Establish your purpose for reading: narrative = for literary experience / enjoyment; expository = for information; functional = to perform tasks / follow directions; educational = to improve reading skills, etc.**

2 **Preview the text to get an idea of what it is about without reading the main body of the text.**

3 **Predict the contents of the text and write questions about it.**

QUESTIONS BEFORE READING

Predictions

1.____?
2.____?
3.____?
4.____?
5.____?

Knowledge transfer (KT) is a term used to encompass a very broad range of activities to support mutually beneficial collaborations between universities, businesses and the public sector. It's all about the transfer of tangible and intellectual property, expertise, learning and skills between academia and the non-academic community. For academics, KT can be a way of gaining new perspectives on possible directions and approaches for research. This two-way exchange element of KT is at the heart of successful and sustainable collaboration. However, the focus on high-quality research outputs has forced researchers to concentrate their efforts mainly on "science-to-science" achievements. Knowledge transfer activities are usually reduced to topics that are associated with university-industry collaboration or the exploitation of research results, such as procurement of patents.

In terms of activities, KT can be split into six types:

People: When students graduate and join the workforce, they bring with them new knowledge and are effectively helping to ‘regenerate the gene pool’ of industry. The temporary placement of students and graduates in companies or in the public or voluntary sectors can be a more directed way of exchanging knowledge on a shorter-term basis.

Publication and events: Knowledge are transferred through publication of research outputs, and through events and networking. For example, in Cambridge, events can vary from Horizon Seminars (which provide a first look at new findings and developments at the University and are organised by Research Services Division) to the Corporate Gateway (offering a bespoke programme of customised meetings with leading University researchers and new technology companies in Cambridge).

Collaborative research: This is a powerful means of creating opportunities for innovative knowledge exchange. In Cambridge, examples include the Cambridge Integrated Knowledge Centre (CIKC), which brings together University research, industry secondments, business acumen and manufacturing expertise to help those with exploitable concepts to achieve commercial success in photonics and electronics; and the Institute for Manufacturing (IfM), which creates new ideas and approaches to modern industrial practice – from understanding markets and technologies, through product and process design, to operations, distribution and related services.

Consultancy: The provision of domain-specific expert advice and training to external clients by university staff can be a very effective KT mechanism. It can provide a platform for the exchange of both explicit and more tacit knowledge, and a window on areas of possible collaboration.

Licensing: Licensing the right to use specific research outputs (intellectual property (IP) such as patentable ideas) is an important KT mechanism. Information on IP that is available for licensing is accessible through various websites, but successful licensing arrangements are long-term relationships often leading to research collaborations and individual contacts.

New businesses: Bringing research outputs to market through the formation of a new business can be particularly appropriate when the application represents a ‘disruption’ to the current market or sector, or where there isn’t any obvious external partner to whom the idea could be licensed. New businesses based on research outputs often build their business models around collaboration with larger, established firms to access expertise, equipment and routes to market.

Three key factors seem to underpin successful KT. First, it’s not a ‘zero cost’ activity; it takes effort and time to make it work. Second, it is a ‘contact sport’; it works best when people meet to exchange ideas, sometimes serendipitously, and spot new opportunities. Third, it needs practical, timely and active support at an institutional level – within companies and universities – encouraging a culture of open access and open innovation.

4 **Have you found answers to the questions you wrote before reading the text? What are they?**

5 **Read the text again and write down any new or difficult words. Look these words up in a dictionary and try to use them in sentences of your own.**

6 **Define a few key words in your word journal. Recommend your partner to practise them in his/her own sentences.**

- ?_______
- ?_______
- ?_______
- ?_______
- ?_______

7 **Work in groups. Write the questions devised by reporters: Who, What, When, Where, Why and How. Ask your partner the questions you wrote to probe the content of the text.**

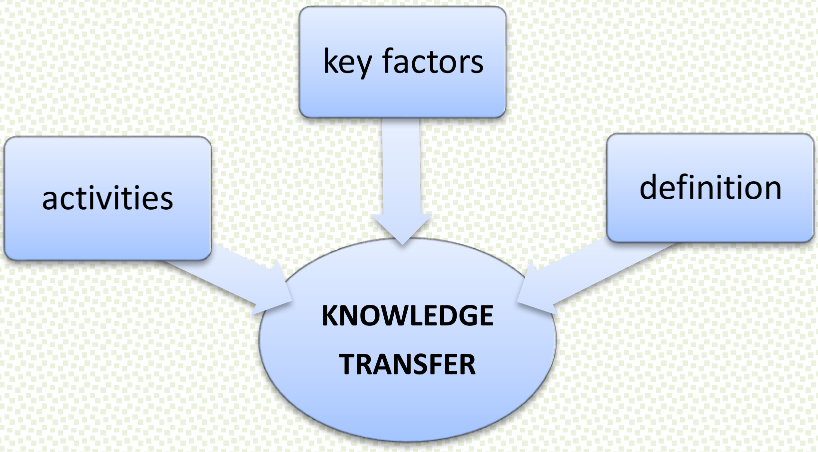
8 **Tick if the following statements are true (T) or false (F). Correct the false ones. Give arguments using the information from the text.**

?	T	F
1. Knowledge transfer means collaboration between academia and the non-academic community.		
2. Knowledge transfer activities are only concerned with teacher-student collaboration.		
3. Collective research, individuals and a contact sport are the types of knowledge transfer.		
4. Publication of research outputs is closely connected with KT.		
5. KT works best when people meet to exchange ideas, sometimes successfully, and spot new opportunities.		

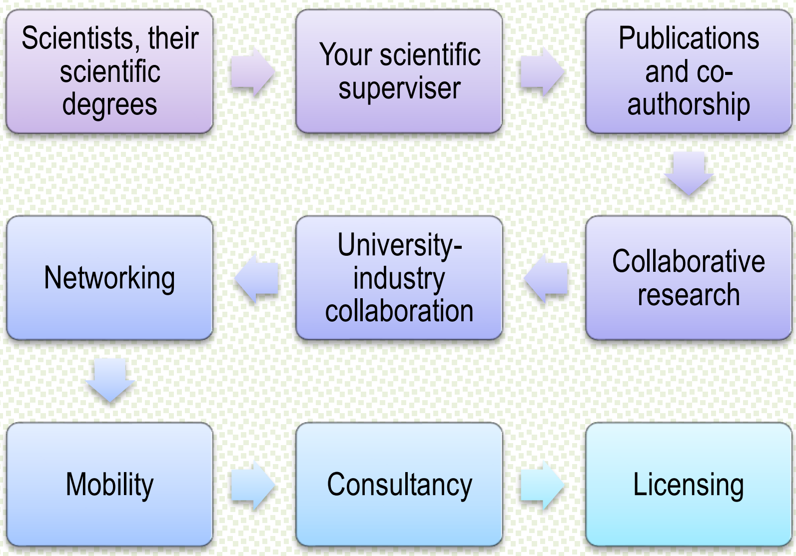
9 **Guess the notion defined. Briefly describe it. Use the information from the text. Discuss with your partner.**

a) opportunities for innovative knowledge exchange ________
b) an important KT mechanism to use specific research outputs (intellectual property) ________
c) a way of gaining new perspectives on possible directions and approaches for research ________
d) a window on areas of possible collaboration ________
e) a more directed way of exchanging knowledge on a shorter-term basis ________

10 **Summarize the information from the text in writing and get ready to speak about knowledge transfer. Express your attitude to the text.**



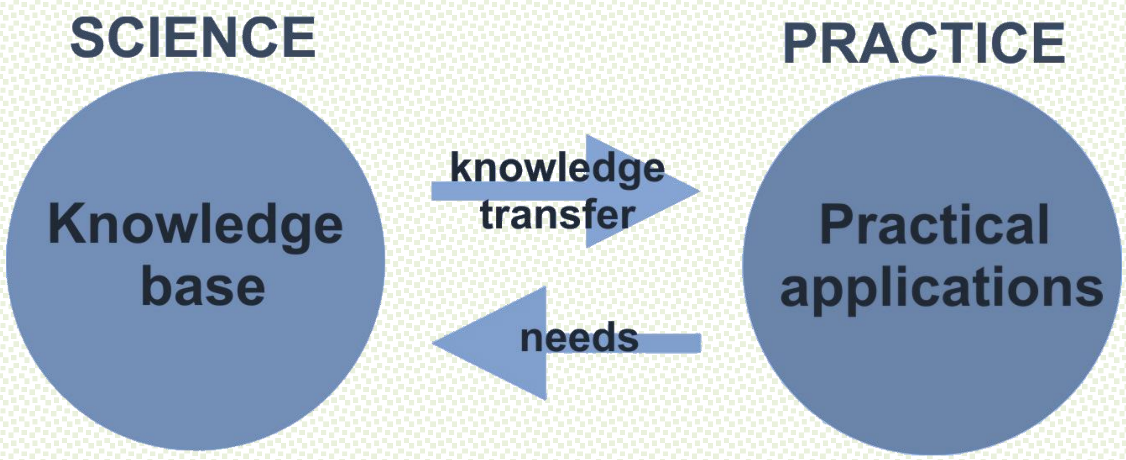
12 **Write a personal essay about knowledge transfer in your university. Use the following plan:**



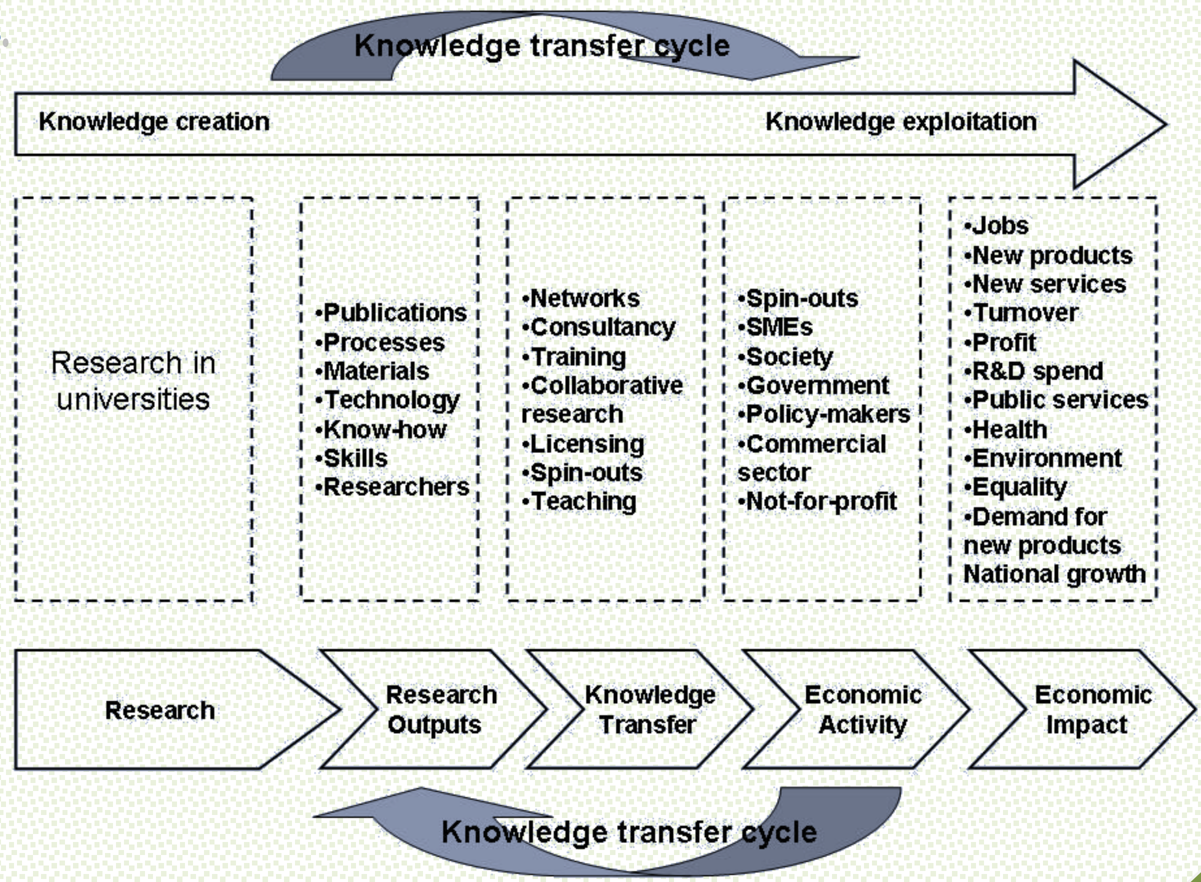
Workshop

13 **Write a process description of your own choice.**

A.



B.



☐ Translate

14 **Make up a written translation of the text.**

The rationale behind Industry-Science Relations is to transfer knowledge between the parties. Therefore, the nature of the knowledge that is being transferred is very important in this research. The nature of knowledge has many dimensions. Three dimensions have been prominent in the literature. A first distinction can be made between explicit and tacit knowledge. The nature of explicit knowledge is that it can be transferred without the presence of people. Explicit knowledge flowing between university and industry can exist of patents, scientific articles, books, etc. Tacit knowledge however, is embodied in people and cannot be transferred without them. It is the knowledge that people acquire by actually doing their job and conducting research and it cannot (yet) be transferred by writings or drawings. In human history, tacit knowledge has always existed but explicit knowledge has not. In fact, explicit knowledge is a translation of tacit knowledge and is being used by humans since the development of writing.

Knowledge may also get articulated from tacit knowledge to explicit knowledge, but it may also flow the other way as well, converting explicit knowledge into tacit knowledge. However, it can be argued that not all tacit knowledge can be translated to explicit knowledge. Good examples of this are search heuristics. An experienced operator of a complex system, like a chemical plant, will use a certain search heuristic to find the factor that causes the problem. It is very hard, maybe even impossible, to translate this search heuristic into explicit knowledge. Although due to the ICT-revolution, the importance of explicit information is increasing in some sectors, the transfer of tacit knowledge is often considered to be a very important element of knowledge transfer. A second dimension in describing the nature of knowledge can be identified as multidisciplinary vs. mono-disciplinary research.

Knowledge has traditionally been developed by specialists who organize in disciplines. But at the edge of knowledge development, the boundaries between such disciplines are often fuzzy, and combinations of knowledge from different disciplines are necessary to achieve progress. A good example of this is the aeronautical engineering. In this field of technology, the engineer has to have knowledge regarding physics, mechanical engineering, material technology, electrotechnical engineering, aerodynamics, etc. Mono-disciplinary knowledge can be found in fields of science like mathematics, electrotechnical engineering, etc. A third and final way to classify knowledge is related to the basic vs. applied nature of the research. Basic, applied and experimental research can be distinguished. Basic research is aimed at gaining insight in the world surrounding us. Applied research focuses on the creation of actual knowledge that can be used, for example in artifacts. A last category of knowledge can be identified as experimental. Experimental research tries to identify whether a certain variable has an effect on another variable. Taken in a simplistic way, the distinction between these three types of research may suggest a linear view of technological development, starting with basic research, and through applied and experimental work leading to an innovation. Such a linear view has been criticized on the grounds that actual innovation projects will show many feedback moments between such types of research (and, in fact, other activities than pure research). Nevertheless, it is clear that the time horizon at which research results may be applied differs between industry and university, despite the fact that different types of research influence each other. It has been argued that private firms may have too little incentive for performing basic research, which immediately makes the case for ISR. But there may also exist 'indirect' reasons for private firms to undertake basic research. For example, even if basic research does not lead to immediate monetary pay-off, it might give researchers working in firms an access ticket to the academic community, where they can pick up useful ideas and knowledge.

§ 8

SCIENCE COMMUNICATION

☐ ***Read***
☐ ***Speak***
☐ ***Write***

1 **Skim the text very quickly to get a general impression. Read the text. Pay attention to text features like the introduction, main body and conclusion. Establish their purpose.**

1. Science communication is a part of a scientist's everyday life. Broadly speaking science communication means any activity that involves one person transmitting science-related information to another, from peer-reviewed articles to tweets. Moreover, scientists must give talks, write papers and proposals, communicate with a variety of audiences, and educate others. Thus, to be successful, regardless of a field or a career path, scientists must learn how to communicate and how to communicate effectively. In other words, to be a successful scientist, you must be an effective communicator.

2. Effective communication means transmitting your message clearly and concisely so that it is understood. When scientists are able to communicate effectively beyond their peers to broader, non-scientist audiences, it builds support for science, promotes understanding of its wider relevance to society, and encourages more informed decision-making at all levels, from government to communities or to individuals. It can also make science accessible to audiences that traditionally have been excluded from the process of science. It can help make science more diverse and inclusive.

3. Although having more scientists who are effective communicators benefits science and society greatly, there are still relatively few training opportunities for science students and professionals to develop these skills. Fortunately, effective communication skills are no longer perceived as soft skills. Increasingly, they are becoming part of the core professional skills every science student and professional should have. Many science communication training programs and courses for scientists use the public communication of science as a tool to develop effective communication skills. Public communication encourages scientists to think about the

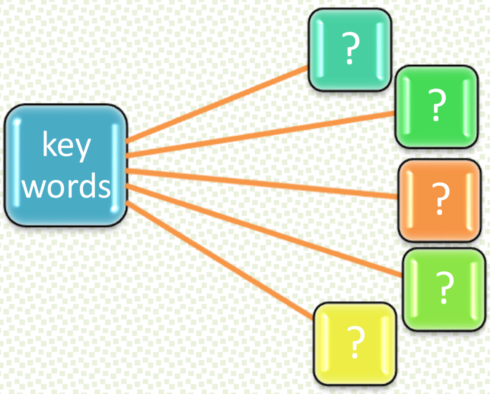
big picture. For instance, scientists can get bogged down with the specifics of a research question or use too much jargon to explain a concept. Public communication encourages scientists to find simple, more succinct ways to get the essentials of their message across.

4. Public communication of science is not for everyone, of course. We can't expect all scientists to use Twitter, participate in their local school's career day or blog, but a little bit of effort goes a long way. Sure, no one can argue that writing a peer-reviewed research article is the same as writing a science blog for high school students, or that giving a talk to your peers at a scientific conference is the same as standing in front of a group of middle schoolers to teach them about chemistry. Although public communication may seem very different from scholarly communication of science, the principles and strategies that make messaging effective in each arena are very similar. For example, know your audience. Who are they? You always need to know who you are trying to reach, as it affects everything else you do. Are you trying to reach peers in your field or are you communicating across fields? Are you talking to a potential funder or to a local reporter? Regardless of your message and your goal, you always need to know your audience.

5. "If you can't explain it simply, you don't understand it well enough," Albert Einstein said. As experts, scientists have a deep knowledge of particular subjects. To communicate something effectively, one needs a similarly deep knowledge of the associated skills. Public communication offers scientists ways to learn and practice the basics of effective communication. By teaching scientists how to explain their work simply – and more effectively – public communication increases the impact of science in multiple dimensions.

2 **Read the text again and write down any new or difficult words. Look these words up in a dictionary and try to use them in the sentences of your own.**

3 **Define a few key words in your word journal. Recommend your partner to practise them in his/her own sentences.**

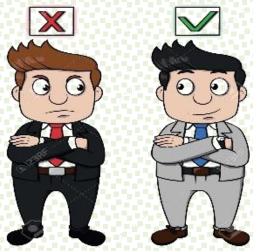


4 Read the text again and fill in the table below. Compare your results with your partner.

Paragraph of the text	✔ I know	+ New information	- I think differently	? Need to learn more	! Controversial point
1.					
2.					
3.					
4.					
5.					

5 **Work in groups. Write the questions devised by reporters: *Who, What, When, Where, Why and How*. Ask your partner the questions you wrote to probe the content of the text.**

6 **Read the following statements. Do you agree with them? Give arguments using the information from the text.**

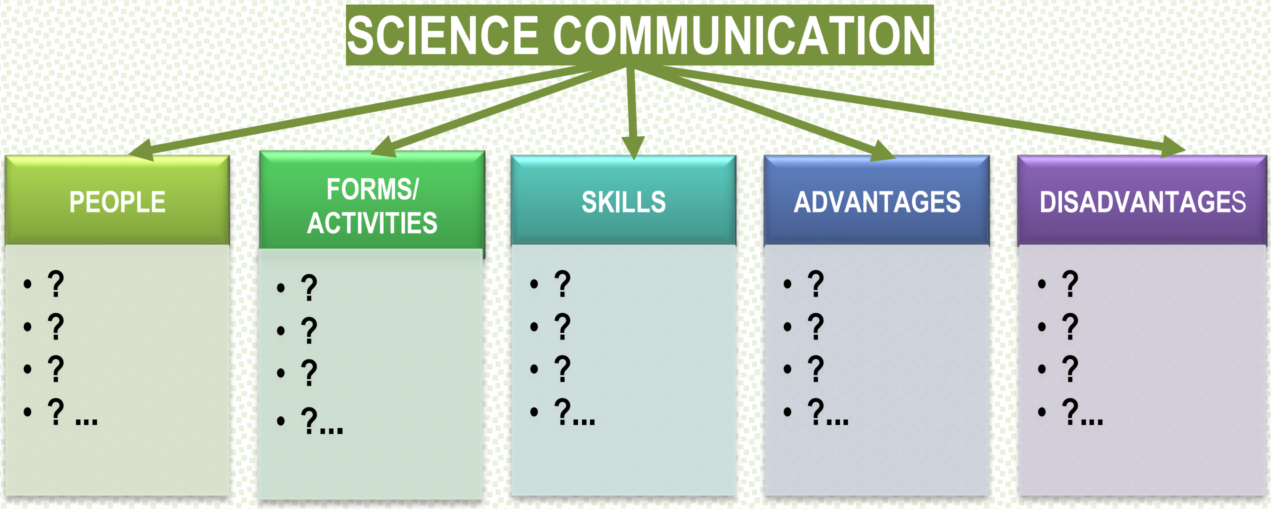


1. To be a successful scientist is more important than to be an effective communicator.
2. Giving talks, writing papers and proposals, communication with a variety of audiences are some of the examples of scientific communication.
3. Effective scientific communication makes science available to ordinary people.
4. It is not difficult to develop communication skills as there are a lot of training opportunities for science students and professionals.
5. Public communication encourages scientists to use too much jargon to explain a concept.
6. Public communication may seem very different from scholarly communication of science.
7. Public communication offers scientists ways to learn and practice the basics of their science.

7 **Working with a partner, brainstorm ideas for the following:**

1. One of the essential activities of a scientist's everyday life is science communication.
2. Effective communication makes science clearer.
3. Effective communication skills are the core professional skills for scientists.
4. Despite your message and your goal, you always need to know your audience.
5. "If you can't explain it simply, you don't understand it well enough," Albert Einstein.

8 **Fill in the mind map below. Summarize the information from the text in writing and get ready to speak about science communication. Use the mind map you filled in. Express your attitude to the text.**



9 **Read the quotations given below. How can you comment on them? What do you know about these people? What are they famous for? Try to imagine what the author had in mind when they worded the quote. Think what could've affected their viewpoint.**

1. Nothing in science has any value to society if it is not communicated, and scientists are beginning to learn their social obligations. (*Anne Ro*)
2. Not only is it important to ask questions and find the answers, as a scientist I felt obligated to communicate with the world what we were learning. (*Stephen Hawking*)
3. There is no substitute for science communication to the public and policy makers. (*Lailah Gifty Akita*)

4. If you can’t explain what you’re doing and why you’re doing it to any intelligent layman, that really means that you don’t understand it yourself. (*Allan Bromley, former President of the American Physical Society*)

5. In science the credit goes to the man who convinces the world, not to the man to whom the idea first occurs. (*Sir Francis Darwin*)

6. Clear writing is an essential ingredient of any communication and especially scientific communication. For example, in Science, we don’t encourage clear writing, we insist on it. (*Dr. Alan Leshner, CEO, AAAS*)

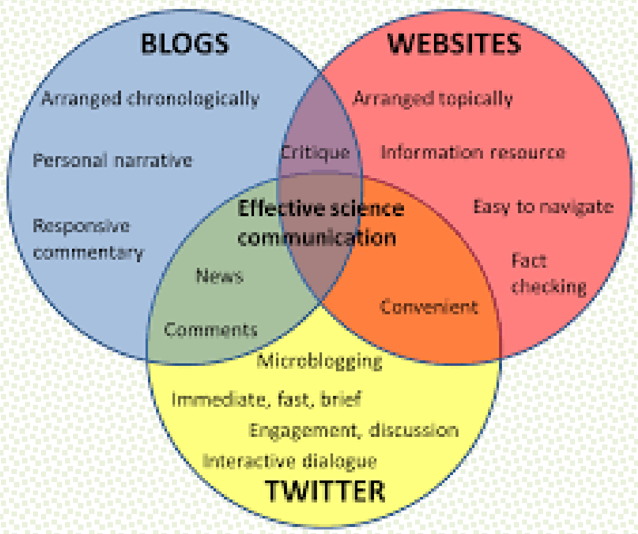
7. Wikipedia was a big help for science, especially science communication, and it shows no sign of diminishing in importance. (*Aubrey de Grey*)

Workshop

10 **Write a process description of your own choice.**

A.

B.



§ 9

SOURCES OF SCIENTIFIC INFORMATION

☐ ***Read***

☐ ***Speak***

☐ ***Write***

1 **Establish your purpose for reading: narrative = for literary experience / enjoyment; expository = for information; functional = to perform tasks / follow directions; educational = to improve reading skills, etc.**

2 **Preview the text to get an idea of what it is about without reading the main body of the text.**

3 **Predict the contents of the text and write questions about it.**

QUESTIONS BEFORE READING

Predictions

1.____?
2.____?
3.____?
4.____?
5.____?

Science communication can be defined as the exchange of scientific information with target audiences. For science communication to be effective, there is a need for scientists to understand which sources of information their audiences use and trust.

Currently, scientists have an unprecedented choice of outlets to distribute scientific information. Although traditional approaches (e.g., peer-reviewed journals and academic conferences) are effective for scientists communicating among themselves, science communication requires other outlets to reach broader, non-scientist audiences. For example, news and specialized science media outlets can be used to provide information to the public (e.g., television, newspapers, and radio), and web-based media (e.g., podcasts and social media) are increasingly utilized by scientists to communicate with target audiences directly.

With so much choice in communication outlets, trust becomes an essential criterion that factors into how audiences consume scientific information. Even primary research includes a degree of uncertainty and non-scientists can often equate uncertainty with a lack of understanding. This disconnect between scientists and non-scientists can be magnified if there is an additional lack of trust due to the medium by which scientific information is disseminated. For example, if scientific information is readily available through social media and other online tools but users of those information sources do not fully trust them, then these outlets may not be the optimal mechanism for exchanging information. Understanding the trust audiences have in a communication medium can enable scientists to make choices to reach their target audiences effectively.

There is a growing interest among scientists to improve communication with broader audiences, including policymakers, natural resource managers, non-academic scientists, students and the general public. Each of these target audiences requires accurate scientific information to make informed decisions.

Members of all groups trust peer review over other sources, but of all groups, as it is reported the general public has the lowest trust of peer-reviewed journals, and uses this information source the least, on average. Participants between the ages of 26 and 30 exhibit higher trust of social media, whereas non-academic scientists and the general public exhibit significantly less trust of social media. Participants over age 50 and the general public also use social media less to access scientific information.

Peer review has long been the gold standard by which scientists measure information and communicate results. Although scientists commonly rely on peer-reviewed journals, the general public uses them the least of all groups and instead tends to learn from personal experiences, news outlets, or colleagues. Personal experience and colleagues are both widely used and trusted sources of scientific information among all groups, a trend that suggests ease of accessibility and the desire for discovery-based learning.

It was found that over half of the staff members in US state health departments did not use peer-reviewed journals to find evidence, with access and cost identified as reasons. The problem of poor access to scientific research is likely magnified for the general public, who may, in turn, be forced to access scientific information from other, likely non-peer-reviewed sources. As scientific research continues to become more “open”, there is great potential for scientists to engage in meaningful interactions with other groups. However, there are still barriers for authors to make their work open access, including publication costs, limitations in the types of open access journals that are available (e.g., certain disciplines may have few open access journals available to publish in), and in some cases, perceive lower quality of open access journals (e.g., predatory publishers, newer publications having low citations if they are not adequately indexed and searchable). However, there is evidence when controlling for journal age and discipline citation rates for open access articles are nearly identical in biomedical fields, and certainly over time, as open access articles are more widely accessible, many will have increased readership and citations. However, a general lay audience may still have difficulties in understanding the technical language of a scientific paper. So, to communicate the main points of a paper to a wider audience, journals could consider publishing lay abstracts (i.e., plain language summaries) with traditional abstracts. In addition, publicizing these lay abstracts through social media, which is already widely used by scientists and non-scientists alike, might be effective for engaging a diversity of audiences. Scientists are increasingly using social media to engage with target audiences. However, to build trust in this medium, there is a need for mechanisms that distinguish trustworthy science from non-peer-reviewed information. One possibility might be the creation of "verified" social media accounts of leading scientists as a means of evaluating the quality and integrity of shared information. Such a platform could function like some open access journals where both reviews and author responses are published alongside the original research with a lay, rather than academic, readership as the target. Social media would also allow target audiences to engage directly with scientists through posting questions or comments. The relatively low use of peer-reviewed journals among non-scientists may also reflect that many peer-reviewed studies are inaccessible behind paywalls. It is very likely that many members of the general public may be unclear about whether a publication is actually a peer-reviewed journal or not. It would likely be beneficial for scientists to conduct outreach educating the public about what peer review means, and how to evaluate journals and peer-reviewed articles. Understanding how to critique science on their own would likely increase the trust the public has in the scientific process.

Trust and use of scientific information differ based on audience. Even so, key trends such as the high use of social media by the public and the high trust of peer-reviewed journals point to a path for enhancing communication between groups. With calls for science communication to be more effective, understanding how individuals get and trust scientific information outlets is essential to ensuring the right message reaches the right audience.

4 **Have you found answers to the questions you wrote before reading the text? What are they?**

5 **Read the text again and write down any new or difficult words. Look these words up in a dictionary and try to use them in sentences of your own.**

6 **Define a few key words in your word journal. Recommend your partner to practise them in his/her own sentences.**

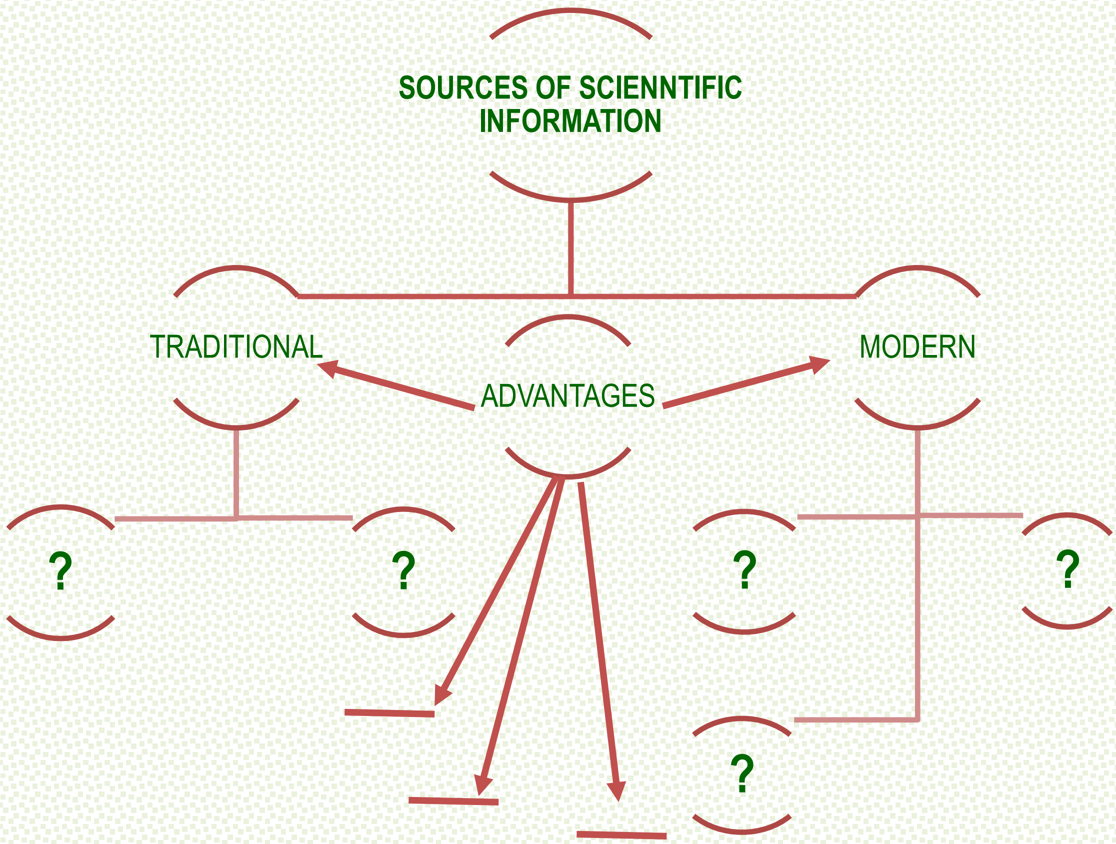
- ?______
- ?______
- ?______
- ?______
- ?______

7 **Work in groups. Write the questions devised by reporters: Who, What, When, Where, Why and How. Ask your partner the questions you wrote to probe the content of the text.**

8 **Tick if the following statements are true (T) or false (F). Correct the false ones. Give arguments using the information from the text.**

?	T	F
1. The exchange of scientific information with target audiences is known as academic conferences.		
2. If scientists know which sources of information their audiences use and trust science communication will be effective.		
3. Peer-reviewed journals and academic conferences are effective for scientists communicating among non-scientist audiences.		
4. The choice of outlets to distribute scientific information is rather limited.		
5. An essential criterion that factors into how audiences consume scientific information is confidence.		
6. Scientists are not interested in improving communication with broader audiences, including policymakers, the general public, etc.		
7. Participants of different ages trust different sources of scientific information.		
8. Members of all groups trust peer review over other sources.		
9. Publishing plain language summaries with traditional abstracts could help communicate the main points of a paper to a wider audience.		
10. Members of the general public are able to understand whether a publication is actually a peer-reviewed journal or not.		

9 **Fill in the mind map below. Summarize the information from the text in writing and get ready to speak about sources of scienntific information. Use the mind map you filled in. Express your attitude to the text.**



Workshop

10 **Write a process description of your own choice. Identify the importance of various sources of scientific information.**

Prompt. *Make additional study to understand the actual value of each of these sources better, using more focused questions, interviews, and other research methods designed to identify what kinds of information, within which specific contexts, and to what ends, are obtained from each of these sources.*

Source	Weighted value
World Wide Web	145
Solicited source (*e.g. consultant, expert testimony*)	132
Scientific Journal	129
Popular Media (*e.g. newspapers, magazines, radio, television*)	120
E-mail Listserv	111
Unsolicited source (*e.g. lobbyist, briefings, constituent-provided*)	104

§ 10

SCIENTIFIC WRITING

☐ ***Read***

☐ ***Write***

☐ ***Speak***

1 **Before you read, discuss the questions below with your partner.**

1. How important is it for you to publish in journals in your field? Why?

2. What are some challenges that novices may face?

2 **Skim the text. Create the "big picture" or main idea of the text.**

Conducting scientific research is only the beginning of discovery. In order for the results of research to be accessible to other professionals and have a potential effect on the greater scientific community, it must be written and published. Most scientific discoveries are published in peer reviewed journals which are those that utilize a process by which the author's peers, or experts in the content area, evaluate the manuscript. Following this review the manuscript is recommended for publication, revision or rejection. It is the rigor of this review process that makes scientific journals the primary source of new information that impacts clinical decision-making and practice.

The task of scientific writing is a time consuming and often daunting task. Barriers to effective writing of novice researchers include lack of experience, poor writing habits, writing anxiety, unfamiliarity with the requirements of scholarly writing, lack of confidence in writing ability, fear of failure, and resistance to feedback. However, the very process of writing can be a helpful tool for promoting the process of scientific thinking, and effective writing skills allow professionals to participate in broader scientific conversations. Furthermore, peer review manuscript publication systems requiring these technical writing skills of novices can be developed and improved with practice. Having an understanding of the process and structure used to produce a peer reviewed publication will surely improve the likelihood that a submitted manuscript will result in a successful publication.

Clear communication of the findings of research is essential to the growth and development of science and professional practice of all researchers and especially novice researchers in the beginnings of their careers. The culmination of the publication process provides not only satisfaction for the researcher and protection of intellectual property, but also the important function of dissemination of research results, new ideas, and alternate thought. It ultimately facilitates scholarly discourse. In short, publication of scientific papers is one way to advance evidence-based practice in many disciplines. Failure to publish important findings significantly diminishes the potential impact that those findings may have on professional practice.

Scientific writing is a technical form of writing that is designed to communicate scientific information to other scientists. Publications in peer-reviewed journals will help novice researchers refine their ideas and increase their expertise, because the act of writing is itself a valuable tool for learning and for fostering the scientific thought process.

Depending on the specific scientific genre (e.g. a journal article, a scientific poster, a research proposal) some aspects of the writing may change, such as its purpose, audience, or organization. Many aspects of scientific writing, however, vary little across these writing genres. Important hallmarks of all scientific writing are summarized below.

What are some important hallmarks of professional scientific writing?

1. Its primary audience is other scientists.

Because of its intended audience, student-oriented or general-audience details, definitions, and explanations which are often necessary in lab manuals or reports are not terribly useful. Explaining general-knowledge concepts or how routine procedures were performed actually tends to obstruct clarity, make the writing wordy, and detract from its professional tone.

2. It is concise and precise.

A goal of scientific writing is to communicate scientific information clearly and concisely. Flowery, ambiguous, wordy, and redundant language run counter to the purpose of the writing.

3. It must be set within the context of other published work.

Because science builds on and corrects itself over time, scientific writing must be situated in and refere to the findings of previous work. This context serves variously as motivation for new work being proposed or the paper being written, as points of departure or congruence for new findings and interpretations, and as evidence of the authors' knowledge and expertise in the field.

The novice or the developing writer may attempt to polish and perfect his approach to scientific writing. Effective writing skills help new scientists take part in the ongoing, ever-evolving scientific conversations. The practice of scientific writing develops habits of reflection that make researchers better, and publication in respected journals strengthens the scientific process, while playing a crucial role in career advancement.

3 **Read the text again and make a list of the new words which you think will be useful for you in the future. Give:**

- definitions of the words
- indication of whether they are nouns, verbs, adjectives etc.
- phrases in which the word occurs
- other words with the same meaning
- other forms of the words

4 **Define a few key words in your word journal. Recommend your partner to practise them in his/her own sentences.**

5 **Guess the notion defined. Briefly describe it. Use the information from the text. Discuss with your partner.**

a) a detailed study of a subject, especially in order to discover (new) information or reach a (new) understanding: ___________
b) the process of finding information, a place, or an object, especially for the first time, or the thing that is found: ___________

c) a piece of information that is discovered during an official examination of a problem, situation, or object: __________

d) to make information available to people, especially in a book, magazine or newspaper: _________

e) a book, magazine, newspaper, or document, or the act of making information available to people in a printed or electronic form: __________

f) a magazine or newspaper, especially one that deals with a particular subject: __________

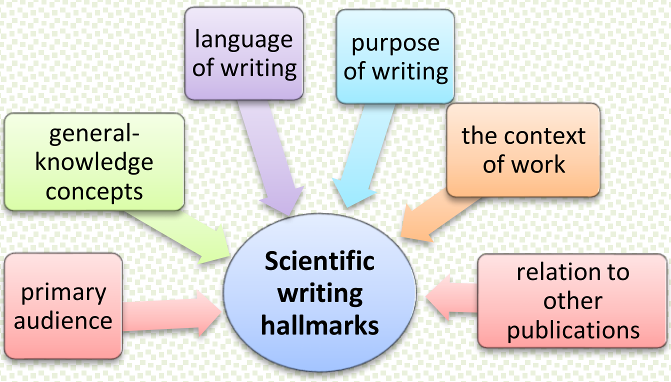
g) the original copy of a book or article before it is printed: __________

h) the skills or activity of creating pieces of written work, such as stories, poems, or articles: __________

6 **Tick if the following statements are true (T) or false (F). Correct the false ones. Give arguments using the information from the text.**

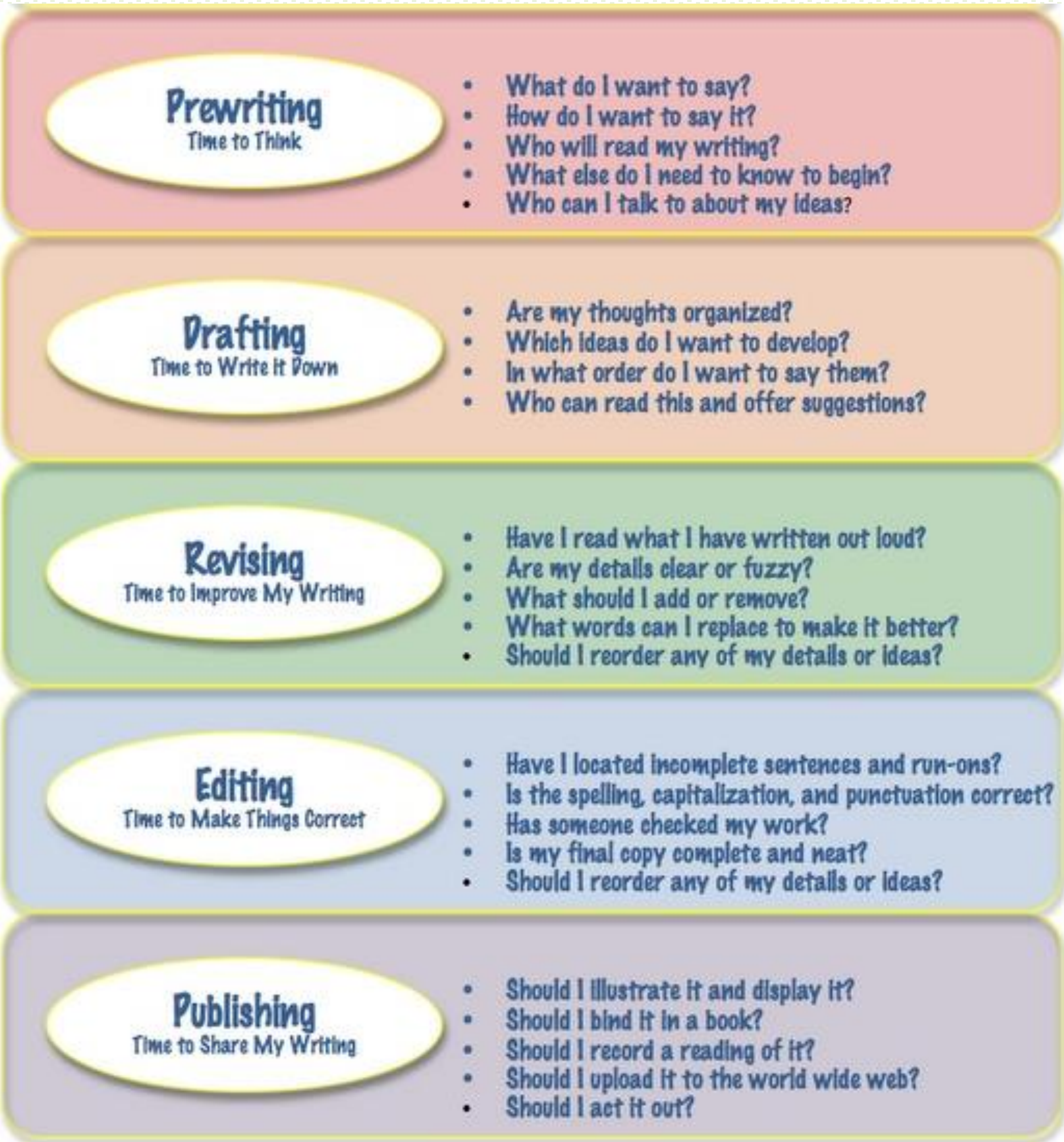
?	T	F
1. Publications in scientific journals help researchers refine their ideas.		
2. The results of research must be written and published to be accessible to other professionals.		
3. Anyone can write and publish a scientific article ignoring the knowledge of valuable writing tools.		
4. Scientific writing is designed to discover scientific information and communicate it to other scientists.		
5. Manuscript publication systems don't require any technical writing skills.		
6. A goal of scientific writing is to develop and improve scientific practice activities of novice researcher.		

7 **Work in pairs. Discuss with your partner the most important hallmarks of professional scientific writing. Use the information from the text and additional information from your general knowledge field.**



8

Write a personal essay about scientific writing process.
Use the mind map given below.



§ 11

SCIENTIFIC PUBLICATIONS

☐ ***Read***

☐ ***Write***

☐ ***Speak***

1 **Establish your purpose for reading: narrative = for literary experience / enjoyment; expository = for information; functional = to perform tasks / follow directions; educational = to improve reading skills, etc.**

2 **Preview the text to get an idea of what it is about without reading the main body of the text.**

3 **Predict the contents of the text and write questions about it.**

QUESTIONS BEFORE READING

Predictions

1.____?
2.____?
3.____?
4.____?
5.____?

To publish is to make content available to the general public. While specific use of the term may vary among countries, it is usually applied to text, images, or other audio-visual content, including paper (newspapers, magazines, catalogs, etc.). The word publication means the act of publishing, and also refers to any printed copies.

Scientific publications are where results and knowledge derived by science are shared and taught to others in the world. Results are no use to anybody if they are not made available to other experts, to be discussed, critically evaluated and built upon. Consequently, ever since the beginnings of modern science, various forms of publishing have played a central role in the work of researchers who need to be able to present their work intelligibly in written form to have it recognized by their peers.

The types of scientific publications are different in different fields. For instance, a clinical trial is possible only in the field of medicine, while an empirical study is more common in the field of social sciences. It is important to remember that not all journals publish every kind of article. Therefore, most journal publishers provide prospective authors with accurate and specific guidelines for the different articles they publish. Specifications about the types of articles published can be found under the guidelines to authors section on a journal's website.

Some of the possible types of scientific publications are:

1. *Original research*. This is the most common type of journal manuscript used to publish full reports of data from research. It may be called an *Original Article*, *Research Article*, *Research*, or just *Article*, depending on the journal. The Original Research format is suitable for many different fields and different types of studies. It includes full introduction, methods, results, and discussion sections. Original research articles are long with the word limit ranging from 3000 to 6000 and can even go up to 12,000 words for some journals. These require a significant investment of time.

2. *Review article*. This type provides a critical and constructive analysis of existing published literature in a field, through summary, analysis, and comparison, often identifying specific gaps or problems and providing recommendations for future research. They are considered as secondary literature since they generally do not present new data from the author's experimental work. Review articles can be of three types, broadly speaking: literature reviews, systematic reviews, and meta-analyses.

Review articles can be of varying lengths depending upon the journal and subject area. For narrative reviews or literature reviews, the length could range anywhere between 8000 to 40,000 words while systematic reviews are usually less than 10,000 words long. However, some journals also publish shorter reviews, around 3000-5000 words long.

3. *Perspective, opinion and commentary* are scholarly reviews of fundamental concepts or prevalent ideas in a field. They are usually essaying that present a personal point of view critiquing widespread notions pertaining to a field. A perspective piece can be a review of a single concept or a few related concepts. They are considered as secondary literature and are usually short articles, around 2000 words.

4. *Research articles* address original research that is of the highest scientific standard and respects the accepted criteria for scientific research in Human-Machine Interaction. Such articles must meet the presentation criteria outlined in the journal's style guide for authors. In order to be accepted for publication, submitted articles must undergo a rigorous peer-review assessment procedure.

5. *Position papers* are articles on a current topic or perspective that are of value to the research community involved in Human-Machine Interaction that the editorial board has deemed relevant for publication. The review process for position papers is less rigorous than for research.

6. *Special issues* on topics of emerging importance can be proposed to the editorial board by one or several people who then serve as editors for the special issue. If the project is accepted, the editors become responsible for writing the call for papers, putting together a pool of reviewers, selecting from the submitted articles and managing the review process in accordance with the general principles of the journal.

7. *Case studies*. These articles report specific instances of interesting phenomena. A goal of case studies is to make other researchers aware of the possibility that a specific phenomenon might occur. This type of study is often used in medicine to report the occurrence of previously unknown or emerging pathologies.

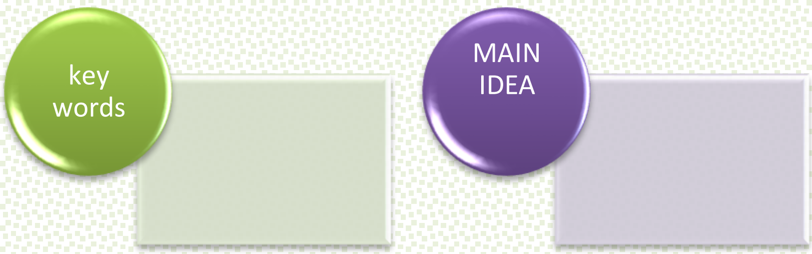
8. *Methodologies or Methods*. These articles present a new experimental method, test or procedure. The method described may either be completely new, or may offer a better version of an existing method. The article should describe a demonstrable advance on what is currently available.

All scientific publications have the same general format. They are divided into distinct sections and each section contains a specific type of information. The number and the headings of sections may vary among journals, but for the most part a basic structure is maintained.

4 **Have you found the answers to the questions you wrote before reading the text? What are they?**

5 **Read the text again and make up a word journal. Write down any new or difficult words. Look these words up in a dictionary and try to use them in a sentence or explain what they mean in your own words.**

6 **Define a few key words in your word journal. Write them to remind the main idea of the text.**

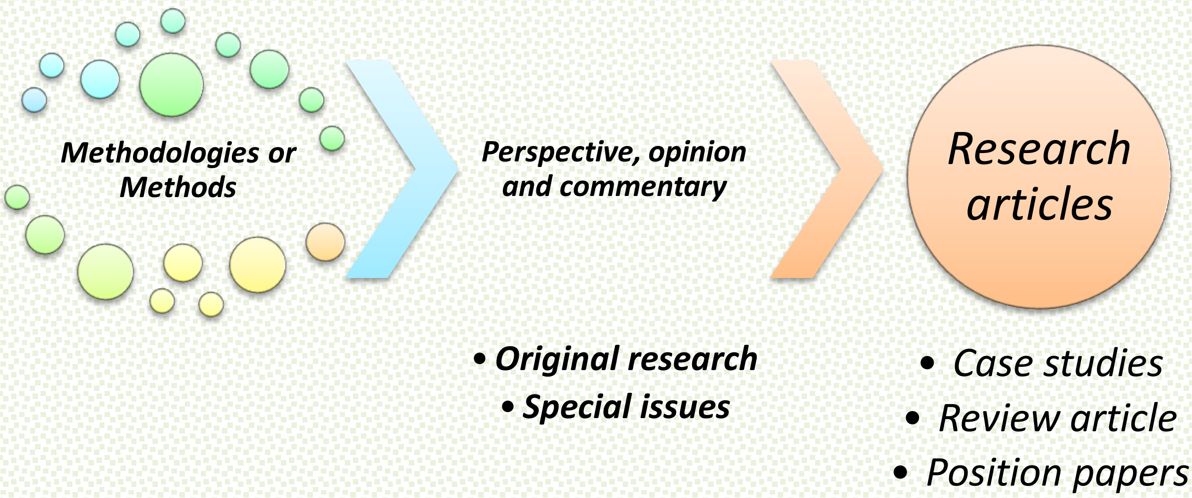


7 **Work in groups. Write the questions devised by reporters: Who, What, When, Where, Why and How. Ask your partner the questions you wrote to probe the content of the text.**

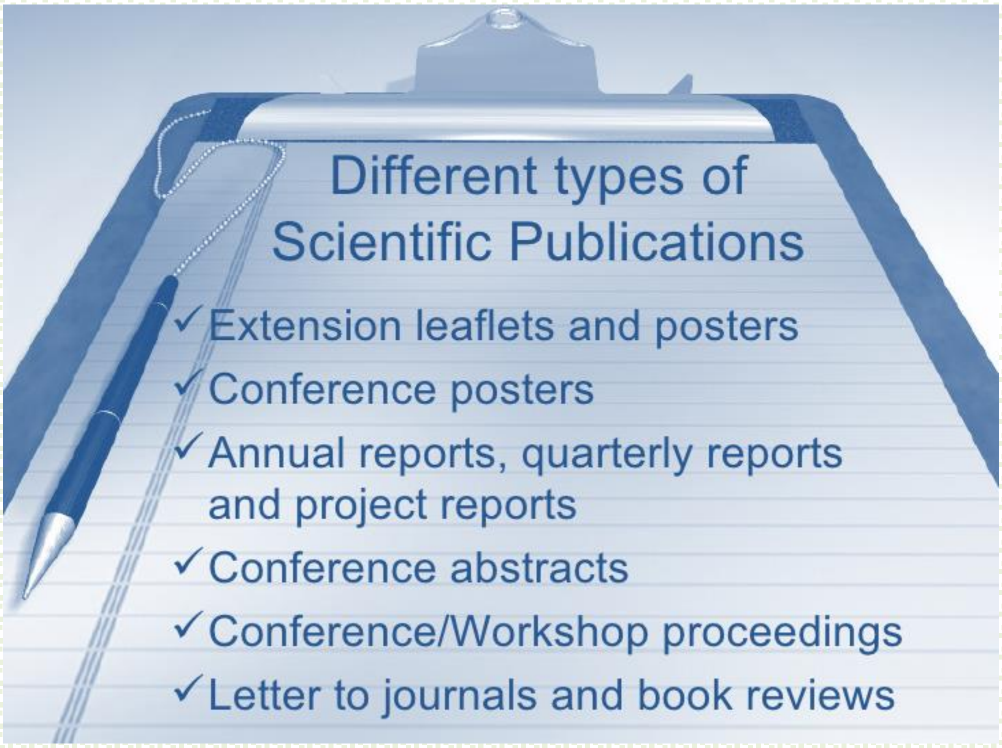
8 **Decide if the following statements are true or false. Prove your choice.**

?	T	F
1. All scientific publications are divided into several sections.		
2. A goal of case studies is present a new experimental method, test or procedure.		
3. Review articles can be of three types, broadly speaking: literature reviews, systematic reviews, and meta-analyses.		
4. Original research articles are used to publish full reports of data from research.		
5. All journals publish every kind of article.		

9 **Summarize the information from the text and get ready to speak about types of scientific publications. Use the mind map given below.**



10 **Write a personal essay about scientific writing process.**
Use the following mind map:



§ 12

SCIENTIFIC PAPER

☐ ***Read***

☐ ***Write***

☐ ***Speak***

1 **Skim the text. Create the "big picture" or main idea of the text.**

2 **Read the text and make up a word journal. Write down any new or difficult words. Look these words up in a dictionary and try to use them in a sentence or explain what they mean in your own words.**

1. Scientists need to share the results and conclusions of their work so that other scientists can debate the implications of the work and use it to spur new research. If scientists do not have access to scientific results the research may as well not have been performed at all. Scientists communicate their results with other scientists by publishing them in science journals.

A formal procedure used in science publication follows a certain set of rules. Scientists describe research in a scientific paper, which explains the methods used, the data collected, and the conclusions that can be drawn. In theory, the paper should be detailed enough to enable any other scientist to repeat the research so that the findings can be independently checked.

A scientific paper is aimed to convey information or to report on a scientific discovery. It should be preceded by a summary with the following sections: introduction (stating the problem and the purpose of the study), methods, results (very concise), and conclusion (very concise).

2. Scientific papers usually begin with a brief ***summary***, or abstract, that describes the findings that follow. Abstracts enable scientists to consult papers quickly, without having to read them in full.

Introduction includes description of the significance of the study (providing background facts and information and stating the problem area of research); wether this problem has been studied previously or not; novelty of the research (description of the problem that will be solved in the article; hypothesis that will be confirmed/disproved); purpose; description of the work.

Methods. This section describes an overview of the materials/methods used; their specifics (number, accuracy, temperature, duration of the experiment, order of steps, and size of the samples as well as how and why they were selected); comparison of the study's materials and methods with those applied by other researchers (optional); the encountered difficulties and problems that other researchers can be faced with while reproducing the experiment (optional).

Results. A general overview of the results, the main results with explanations, their comparison, the encountered difficulties/negative results (optional) and preliminary conclusions based on the results are given in this section.

At this stage the author organizes the statistical data obtained. There should be no subjective statements or contextual analysis. The information is presented in tables and graphs, while the most important results are described in verbal form.

Discussion. This part of the scientific paper presents interpretation of the obtained results in the context of relevant scientific literature/proposal of an alternative explanation. Assessment of the paper's scientific contribution, conclusions, possible limitations, problems/potential application of the results/prospects for further research are also can be found here.

Notes provide a concise description and the results of the research into a specific issue. These articles are not divided into sections, but contain information on the study's relevance and objectives, as well as a complete description of the materials and research methods. They also present summarized findings with examples and, briefly, concrete conclusions. This section includes the author's interpretation of the importance of the results obtained and their contribution to the area of research.

In addition to the above elements, the scientific paper should contain references to the grants awarded, if any, as well as acknowledgements, if the authors received aid or assistance.

At the end of most papers is ***a list of citations*** – bibliographic references that acknowledge earlier work that has been drawn on in the course of the research. Citations enable readers to work backwards through a chain of research advancements to verify that each step is soundly based.

3. Scientists typically submit their papers to the editorial board of a journal specializing in a particular field of research. Before the paper is accepted for publication, the editorial board sends it out for peer review. During this procedure a panel of experts, or referees, assesses the paper, judging whether or not the research

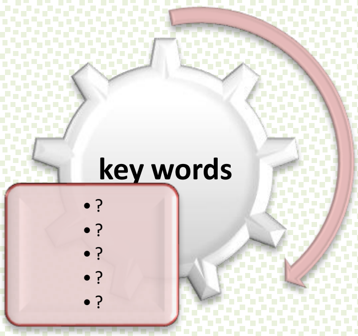
has been carried out in a fully scientific manner. If the referees are satisfied publication goes ahead. If they have reservations some of the research may have to be repeated, but if they identify serious flaws, the entire paper may be rejected for publication.

The peer-review process plays a critical role because it ensures high standards of scientific method. However, it can be a contentious area as it allows subjective views to become involved. Because scientists are human, they cannot avoid developing personal opinions about the value of each other's work. Furthermore, because referees tend to be senior figures, they may be less than welcoming to new or unorthodox ideas.

Once a paper has been accepted and published, it becomes part of the vast and ever-expanding body of scientific knowledge. In the early days of science new research was always published in printed form, but today scientific information spreads by many different means. Most major journals are now available via the Internet (a network of linked computers) which makes them quickly accessible to scientists all over the world.

When new research is published it often acts as a springboard for further work. Its impact can then be gauged by seeing how often the published research appears as a cited work. Major scientific breakthroughs are cited thousands of times a year, but at the other extreme, obscure pieces of research may be cited rarely or not at all. However, citation is not always a reliable guide to the value of scientific work.

3 **Define a few key words in your word journal. Recommend your partner practise them in his/her own sentences.**



4 **Re-read the text with a pen in hand. Find important phrases or statements. But don't limit yourself. Write anything that seems important or striking. Take notes on questions (don't trust your memory). Exchange your notes with your partner and discuss them.**

5 **Reconstruct the author's idea.**

Write down the passage you wish to put into your own words. Underline the main points.

→ List some key ideas, concepts, and phrases. Where possible, note down alternative phrases or synonyms for each of these.

→ Identify the main points in your words.

→ Can you simplify your words further? (This may not always be possible.)

→ Use your words and phrases in steps 3 and 4 to restate the points, without looking at the original text.

→ This is your reconstructed version of the author's idea.

6 **Study the introduction to the text and decide how it could be shortened. List your suggestions and bring them into classroom. Discuss with your partners.**

SUGGESTIONS FOR SHORTENING

a) ______________________________

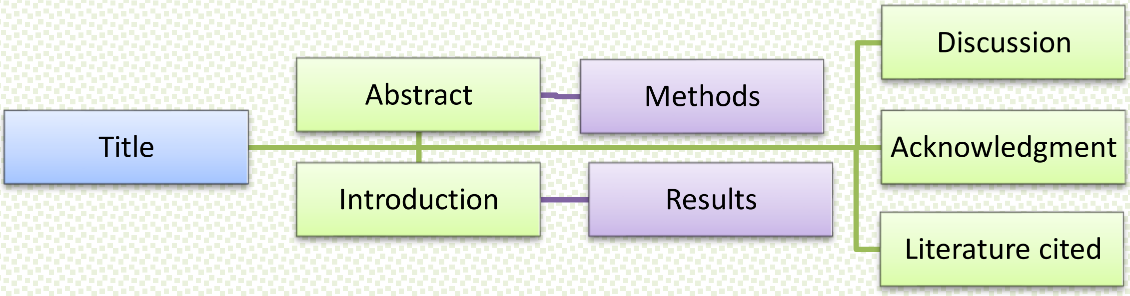
b) ______________________________

c) ______________________________

d) ______________________________

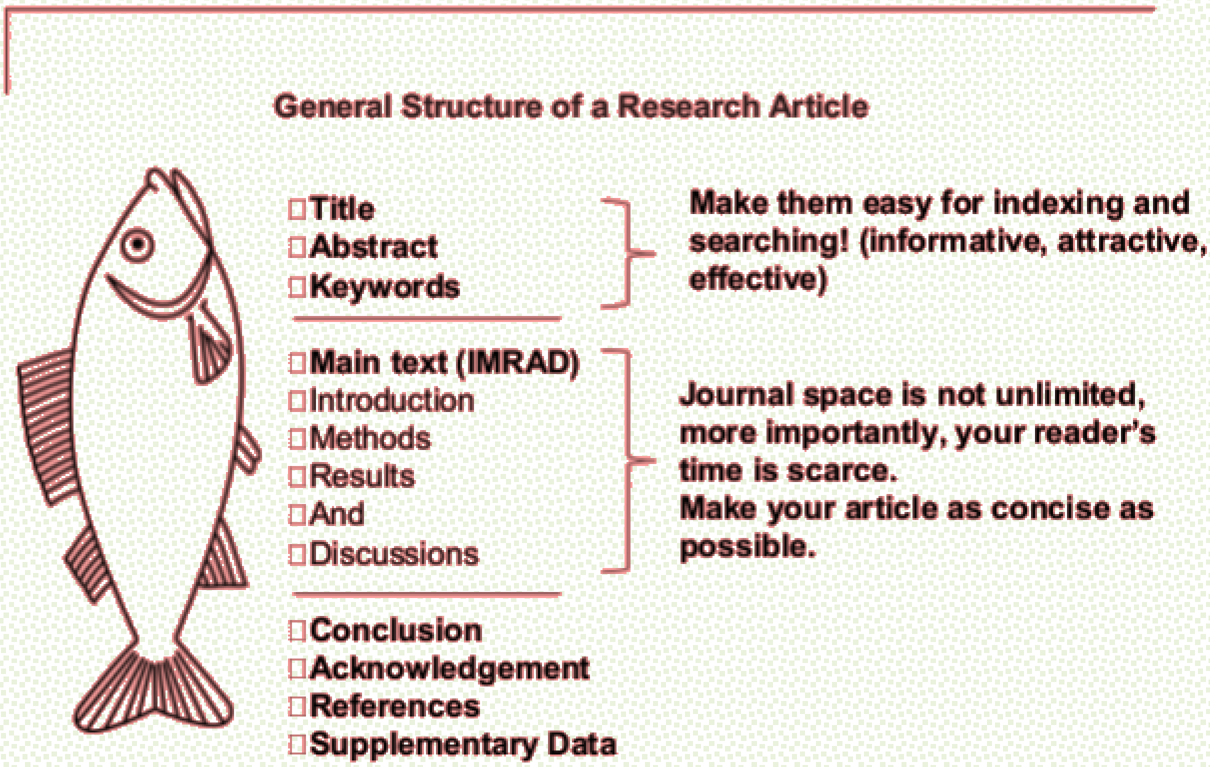
7 **Ask questions of the material as you read. Use the questions devised by reporters: *Who, What, When, Where, Why and How*. Discuss them with you partner(s).**

8 **Match the sections of the scientific paper to their interpretations. Do you agree with this? Why? (Why not?)**



A. This section tells us what people or institutions (in addition to the authors) contributed to the work. In reading it, everyone can see what sources provided financial support for the study.	***E.*** The following section helps to determine exactly how the authors performed the experiment. It describes both specific techniques and the overall experimental strategy used by the scientists. Generally, this section does not need to be read in detail. The reader of scientific paper refers to this section if he has a specific question about the experimental design.
B. This section helps to determine if an article is interesting or relevant for your project. It gives a reasonably complete description of the study that was conducted, and sometimes even foreshadows the findings. It includes the studied species, the kinds of performed experiments and perhaps a brief indication of the obtained results.	***F.*** This section explains the authors interpret their data and how they connect it to other work. Authors often use it to describe what their work suggests and how it relates to other studies. In this section, authors can anticipate and address any possible objections to their work. It is also a place where authors can suggest areas of improvement for future research.
C. This section provides the sources cited throughout the paper. This section offers information on the range of other studies cited: Does the author cite only his or her previous studies? Are both classic and modern sources influencing this work? Does the author look to the work of scientists in other disciplines? The section is also helpful for generating a list of background reading on the topic under study.	***G.*** This section contains the data collected during experimention. It is the heart of a scientific paper. In this section, much of the important information may be in the form of tables or graphs. When reading this section, do not readily accept an author's statements about the results. Rather, carefully analyze the raw data in tables and figures to draw your own conclusions.
D. You will find background information and a statement of the author's hypothesis in this section. It usually describes the theoretical background and indicates why the work is important. A specific research question is stated in this section and a specific hypothesis to be tested is posed.	***H.*** This section provides the reader with a complete, but very succinct summary of the paper. It contains brief statements of the purpose, methods, results, and conclusions of a study. It often includes databases and is usually free to a large audience. Thus, it may be the most widely read portions of scientific papers.

9 **Summarize the information from the text in writing and get ready to speak about the scientific paper and its general structure. Make use of the following mind map.**



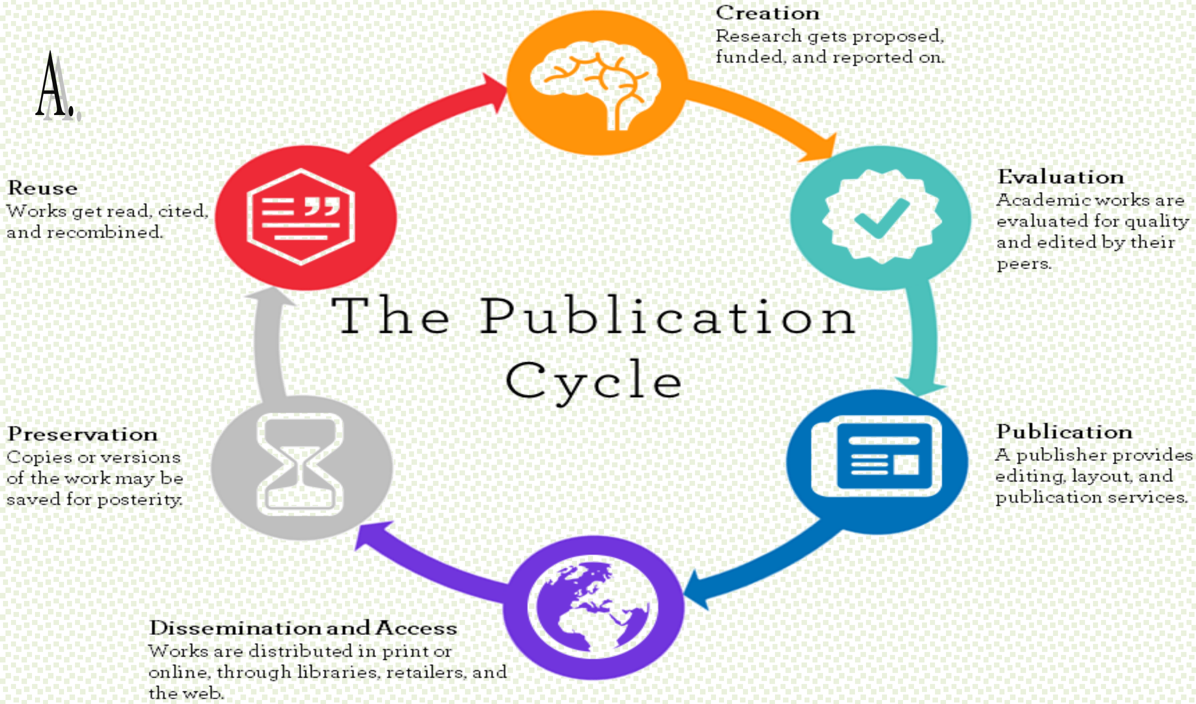
10 **Speak about your own publications. Use the following questions as a guide for your talk.**

1. Have you already published any articles?
2. Where and when did you publish them?
3. What are the titles of your published papers?
4. What is the purpose of your paper?
5. Who are your published papers addressed to?
6. What problems do you deal with in your paper?
7. Is there much or little material published on the subject of your investigation?
8. What do you give much (little) attention to in your published papers?
9. What is of particular interest in your papers?
10. How many parts does your paper consist of?
11. How did you begin (finish) your paper?
12. What do you treat in your introductory part?
13. What do you say in conclusion?

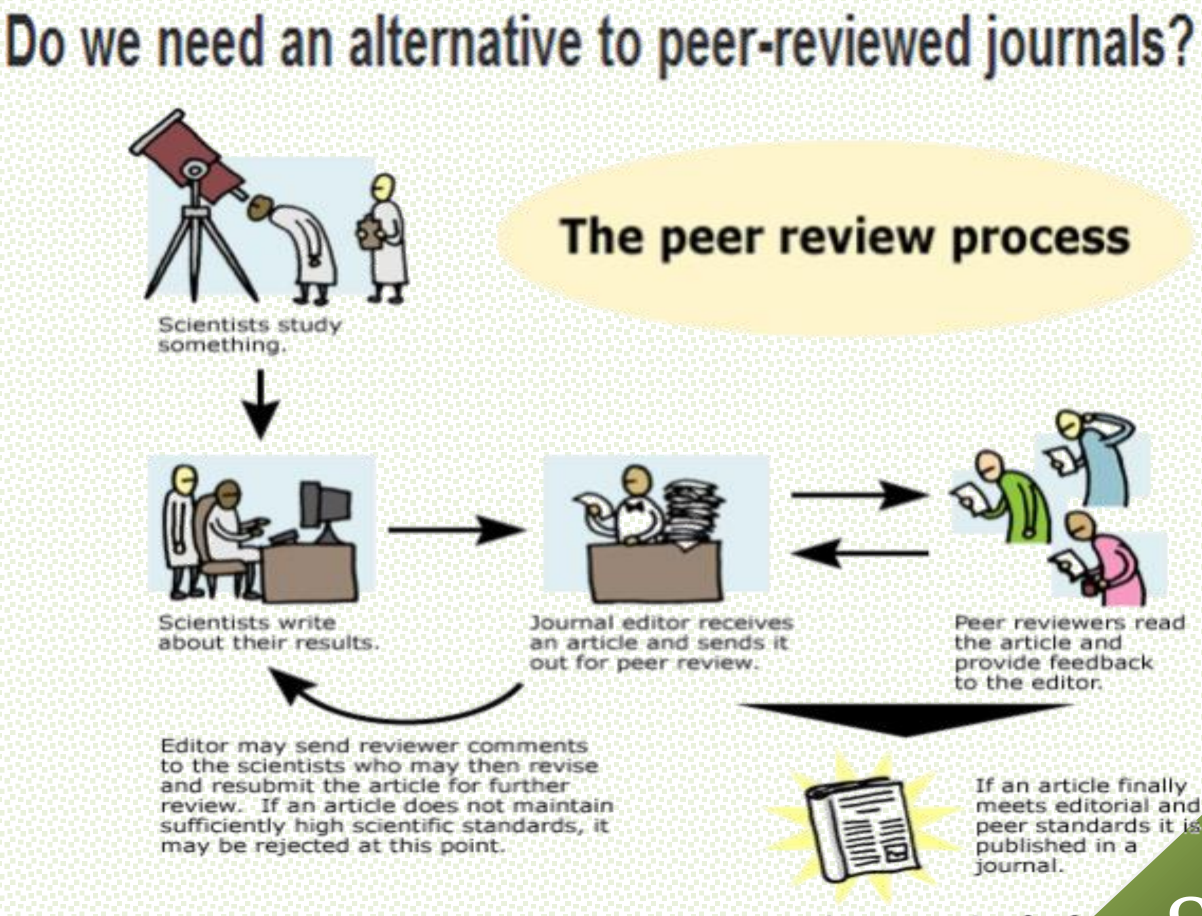
Workshop

11 **Write a process description of your own choice.**

A.



B.



§ 13

HOW TO WRITE A SCIENTIFIC REPORT

☐ ***Read***
☐ ***Speak***
☐ ***Write***

1 **Establish your purpose for reading: narrative = for literary experience / enjoyment; expository = for information; functional = to perform tasks / follow directions; educational = to improve reading skills, etc.**

2 **Preview the text to get an idea of what it is about without reading the main body of the text.**

3 **Predict the contents of the text and write questions about it.**

QUESTIONS BEFORE READING

Predictions

1.____?
2.____?
3.____?
4.____?
5.____?

A scientific report is a document that describes the process, progress, and or results of technical or scientific research or the state of a technical or scientific research problem.

You should be careful about the style of writing in your report. The language you use should be clear and straightforward. It needs to be written in an academic style without unnecessary adjectives and adverbs, and it should be punctuated correctly. Try not to use long-winded phrases such as “at this moment in time” or “owing to the situation that.” You should use “now” or “because” instead. Also, avoid a too “chatty” style of writing or colloquialisms. Your report needs to be business-like and professional.

As with all academic writing, avoid using contractions such as “don’t” and “shouldn’t.” Similarly, as with all academic writing, you should remain objective throughout the report unless you have been specifically told to include your own opinions and thoughts.

Proofreading is essential as with all academic work. Read over your work after every section and reword it if necessary. Once you are happy with the wording, perform a careful read through, paying close attention to grammar, syntax, clarity, and layout.

Elements of a Scientific Report

1. Title page. The title page will include the title of the report and authorship. The title of the report is usually 4-12 words in length. It should be short, specific and descriptive, containing the keywords of the report.

2. Contents. Contents is only required for length reports (usually 6 pages or more).

3. Abstract (annotation). The Abstract is a self-contained synopsis of the report – an informative summary of the results and conclusion. The Abstract should include objectives (as outlined in the Introduction), scope of the investigation and a brief reference to the materials and methods. Literature citations, formulae and abbreviations, references to tables should not be included in the Abstract. Although the Abstract comes first in a report, it is best to write it last, after you have the results and conclusions.

4. Introduction. The purpose of the Introduction is to inform the reader about the reasoning, and to justify why your work is essential in the field.

The Introduction gives an overall review of the paper. It works on the principle of introducing the topic of the paper and setting it in a broader context, gradually narrowing the topic down to a research problem, thesis and hypothesis. A good Introduction explains how you mean to solve the research problem, and creates ‘leads’ to make the reader want to delve further into your work. The Introduction should not include any results or conclusions.

There are a few tips that can help you write a strong Introduction, arouse interest and encourage the reader to read the rest of your work:

Keep it Short. A long and incoherent Introduction will soon put people off and lose you marks.

Define the Problem. The entire Introduction should logically end at the research question and thesis statement or hypothesis. The reader, by the end of the Introduction, should know exactly what you are trying to achieve with the paper. In addition, your conclusion and discussion will refer back to the Introduction, and this is easier if you have a clearly defined problem.

Organization. As you write the paper, you may find that it goes in a slightly different direction than planned. In this case, go with the flow, but make sure that you adjust the Introduction accordingly. Some people work entirely from an outline and then write the Introduction as the last part of the process. This is fine if it works for you.

Once your Introduction is complete, you can now think about tackling the rest of the paper.

5. Discussion. The main body of the report is where you discuss your material. The facts and evidence you have gathered should be analysed and discussed with specific reference to the problem or issue. If your discussion section is lengthy you might divide it into section headings. Your points should be grouped and arranged in an order that is logical and easy to follow. Use headings and subheadings to create a clear structure for your material. Use bullet points to present a series of points in an easy-to-follow list. As with the whole report, all sources used should be acknowledged and correctly referenced.

6. Conclusion. This is the summing up of your experiment/research. The conclusion should:

- be arranged so that the major conclusions come first;
- identify the major issues relating to the case and give your interpretation of them;
- relate specifically to the objectives of the report as set out in the introduction;
- be a list of numbered points;
- follow logically from the facts in the discussion;
- be clean-cut and specific;
- be brief.

7. Appendices. Under this heading you should include all the supporting information you have used that is not published. This might include tables, graphs, questionnaires, surveys or transcripts. Appendices should always be numbered, captioned and referred to from the text. Appendices should be clear and self-contained.

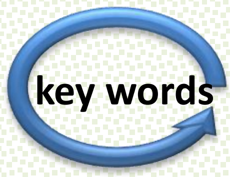
8. References. All published sources referred to in your report should be listed in alphabetical order and formatted according to the style required. Ensure that each item in the reference list has an in-text citation, and every in-text citation has a full reference in the reference list at the end of your paper.

9. Glossary of Technical Terms. It is useful to provide an alphabetical list of technical terms with a brief, clear description of each term. You can also include in this section explanations of the acronyms, abbreviations or standard units used in your report.

4 **Have you found the answers to the questions you wrote before reading the text? What are they?**

5 **Read the text again and write down any new or difficult words. Look these words up in a dictionary and try to use them in the sentences of your own.**

6 **Define a few key words in your word journal. Recommend your partner to practise them in his/her own sentences.**



- ?______
- ?______
- ?______
- ?______
- ?______

7 **Work in groups. Write the questions devised by reporters: Who, What, When, Where, Why and How. Ask your partner the questions you wrote to probe the content of the text.**

8 **Look at the sample introduction below. Match the sentences with the description of what they do. Write the correct description in the spaces given. Pay attention that one of the descriptions is used twice.**

The use of solar water heaters is rapidly increasing in both homes and businesses, as these heaters provide an environmentally friendly and cost-effective source of energy. [ ]

However, significant improvement to heating efficiency is required before solar water heaters can be used without a supplementary energy source. [ ] Various factors in the design of the water heater affect how well solar energy is converted into heat energy and how effectively the heat is then transferred to the water. [ ]
This experiment investigated two factors affecting the heating efficiency of solar water heaters: mass flow rate and collector design. [ ]

Descriptions: ***Aim*** ***Context*** ***Theory***

9 **Review the components of the scientific report. Tick the report section that relates to the statement.**

a) Precisely identifies the focus of the report.

Abstract	
Title	
Introduction	

b) Provides an overview of the report content, including findings and conclusions. Usually the last part of the document to be written. May not be required in a short report.

Conclusion	
Introduction	
Abstract	

c) Provides appropriate background to the experiment and briefly explain any relevant theories.
States the problem and/or hypothesis and
Concisely states the objective/s of the experiment.

Abstract	
Introduction	
Discussion	

d) Interprets key results in relation to the aims/research question.
Summarises key findings and limitations.
Makes recommendations to overcome limitations and indicate future directions in research.

Conclusion	
Glossary	
Discussion	

e) Reminds the reader what problem was being investigated.
Summarises the findings in relation to the problem/hypothesis.
Briefly identifies big-picture implications of the findings (Answers the question "So what?").

Conclusion	
Abstract	
References	

f) Lists the publication details of all sources cited in the text allowing readers to locate sources quickly and easily.
Usually follows a specific referencing style.

Appendices	
References	
Abstract	

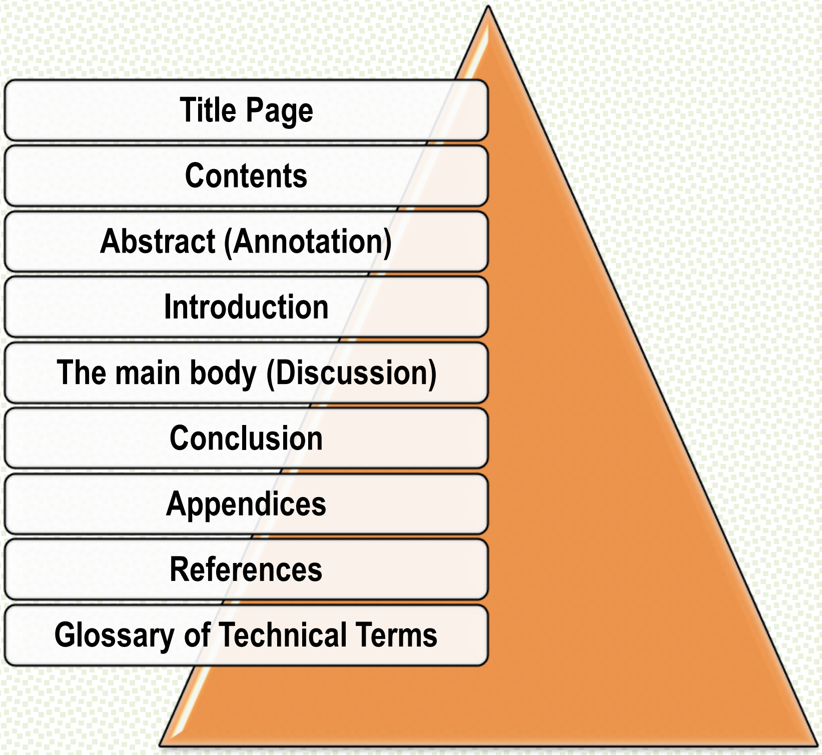
g) Additional information that is relevant but not necessary. For example, detailed collection of data and/or calculations.

Title	
Appendices	
Conclusion	

h) Provides an alphabetical list of specialised or technical words, terms or abbreviations and their definitions, usually related to a specific discipline or field of knowledge.

Appendices	
Conclusion	
Glossary of technical terms	

10 **Summarize the information from the text in writing and get ready to speak about how to write a scientific report. Use the mind map below.**



11 **Using the mind map from the previous exersice write a scientific report based on your master thesis.**

§ 14

A MASTER'S DEGREE

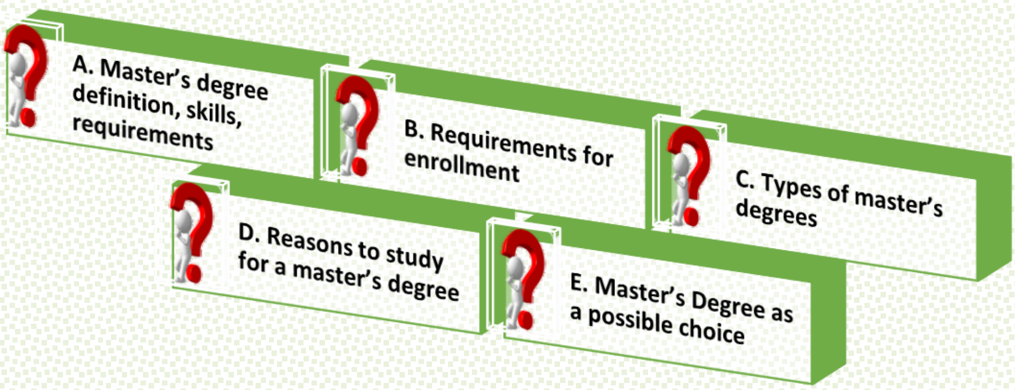
☐ ***Read***

☐ ***Speak***

☐ ***Write***

1 **Skim the text. Create the "big picture" or main idea of the text.**

2 **Read the text again and label the paragraphs with the correct headings.**



1____

A master's degree can be a viable option for those who want to further their knowledge of a particular subject, explore other areas of interest after having completed an undergraduate degree, or improve their career prospects. Master's degree programs mean that prospective students must be prepared for an intensive learning experience that incorporates their undergraduate studies and/or their experience gained from employment.

2____

A master's degree (from Latin "*magister*") is an academic degree awarded by universities or colleges upon completion of a course of study demonstrating mastery or a high-level overview of a specific field of study or area of professional practice.

Students who graduate with a master’s degree should possess advanced knowledge of a specialized body of theoretical and applied topics, a high level of skills and techniques associated with their chosen subject area, and a range of transferable and professional skills in analysis, critical evaluation, or professional application gained through independent and highly focused learning and research and the ability to solve complex problems and think rigorously and independently.

A master's degree normally requires previous study at the bachelor's level, either as a separate degree or as part of an integrated course and typically take one to three years to complete, through either part-time or full-time study. The specific duration varies depending on the subject, the country in which you study and the type of master’s degree you choose.

3____

Broadly speaking, there are two main types of master’s degrees: taught master’s degrees and research master’s degrees. Taught master’s degrees are much more structured, with students following a program of lectures, seminars and supervisions, as well as choosing their own research project to explore. Research master’s degrees, on the other hand, require much more independent work, allowing students to pursue a longer research project and involves less teaching time.

The UK Quality Assurance Agency defines three categories of Master's degrees:

Research master's degrees are primarily research based, although may contain taught elements, particularly on research methods. Examples are the Master of Letters degree (MLitt) (usually, but not always a research degree), the Master's by Research, and the Master of Philosophy (Mphil). The Master's by Research (MbyRes, ResM), which is a research degree, is distinct from the Master of Research (MRes), which is a taught degree concentrating on research methods.

Specialised or advanced study master's degrees are primarily taught degrees, although commonly at least a third of the course is devoted to a research project assessed by dissertation. These may be stand-alone master's courses, leading to, e.g., a Master of Science (MSc), a Master of Arts (MA) or MRes degrees, or integrated master's degrees.

Professional or practice master's degrees are designed to prepare students for a particular professional career and are primarily taught, although they may include work placements and independent study projects. Some may require professional experience for entry. Examples include Master of Business Administration (MBA), Master of Divinity (Mdiv), Master of Law (LLM) and Master of Social Work (MSW) as well as some integrated master's degrees. The name of the degree normally includes the subject name.

The United States Department of Education classifies master's degrees as research or professional. *Research master's degrees* in the US (e.g., M.A./A.M. or M.S.) require the completion of taught courses and examinations in a major and one or more minor subjects, as well as (normally) a research thesis. *Professional master's degrees* may be structured like research master's (e.g., Master of Engineering (M.E./M.Eng.) or may concentrate on a specific discipline (e.g., M.B.A.) and often substitute a project for the thesis.

There are also master’s programs aimed at working professionals (sometimes called executive master’s degrees), and master’s programs that follow directly on from an undergraduate degree (integrated master’s programs). Types of master’s degrees and the names and abbreviations used for them also vary depending on the subject area and the entry requirements. As many master’s degrees are designed for working professionals, many options are available in a variety of flexible study modes. These include distance learning, part-time learning, evening and weekend classes.

Distance learning means that students can learn entirely online, attend a short residential course or visit their chosen institution intermittently. Part-time learning is for those who combine work and study as you can structure your course schedule around your job.

4____

Asking yourself why to study for a master’s degree can help a graduate to formulate his personal statement, a common requirement for most master’s degree applications. The personal statement is a chance for students to explain their reasons for choosing their course, why they want to pursue a master’s degree, and mention any relevant skills, study and/or work experience they already have. Some of the common reasons why students choose to study a master’s degree include subject interest, career development, employability, love of academia, change of direction, etc.

5____

Admission to a master's degree normally requires successful completion of study at bachelor's degree level either (for postgraduate degrees) as a stand-alone degree or (for integrated degrees) as part of an integrated scheme of study. In countries where the bachelor's degree with honours is the standard undergraduate degree, this is often the normal entry qualification. In addition, students will normally have to write a personal statement and, in the arts and humanities, will often have to submit a portfolio of work.

In the UK, students will normally need to have a 2:1. Students may also have to provide evidence of their ability to successfully pursue a postgraduate degree to be accepted into a taught master's course and possibly higher for a research master's. Graduate schools in the US similarly require strong undergraduate performance, and may require students to take one or more standardised tests, such as the GRE, GMAT or LSAT.

3 **Write a few key words for each paragraph to remind the main idea.**

4 **Work in groups. Write the questions devised by reporters: Who, What, When, Where, Why and How. Ask your partner the questions you wrote to probe the content of the text.**

5 **Match the reasons to study for a master's degree to their interpretations. Do you agree with them? Why? (Why not?)**

REASONS

• Subject interest	?
• Career development	?
• Employability	?
• Love of academia	?
• Change of direction	?
• Professional specialization/networking	?
• Academic challenge	?
• Flexibility of study mode	?
• Industry requirement	?

INTERPRETATIONS

A. You wish to change subjects from your undergraduate degree, effectively treating your master's degree program as a 'conversion course' so you can explore a different subject, sector or industry in more detail.

B. You gained a passionate interest in your chosen field of study during your bachelor's degree (or during independent study outside of formal education) and want to further your knowledge in the subject, and/or specialize in a particular area. You may want to pursue in-depth research about the subject, become an academic of the subject or teach it to others. You may also be preparing for PhD-level research.

C. Your chosen professional field puts immense value on master's degrees. The value of a master's degree varies by field. While some fields require a master's degree without exception, others do not require advanced degrees for advancement or employment, while in some cases a master's degree career progression comparable to a doctoral degree (for example, in social work, the pay differential between doctoral degree graduates and master's degree graduates is fairly slim).

D. You need a master’s degree in order to acquire further knowledge, qualifications or skills in order to pursue a particular career, advance in your present career or even change careers altogether. Make sure to check with professional bodies or employers to ensure your chosen course is properly recognized or accredited before applying. Lawyers, doctors, teachers, librarians and physicists may all require postgraduate qualifications.

E. You appreciate the flexibility of study provided by master’s courses which are often available in many teaching modes.

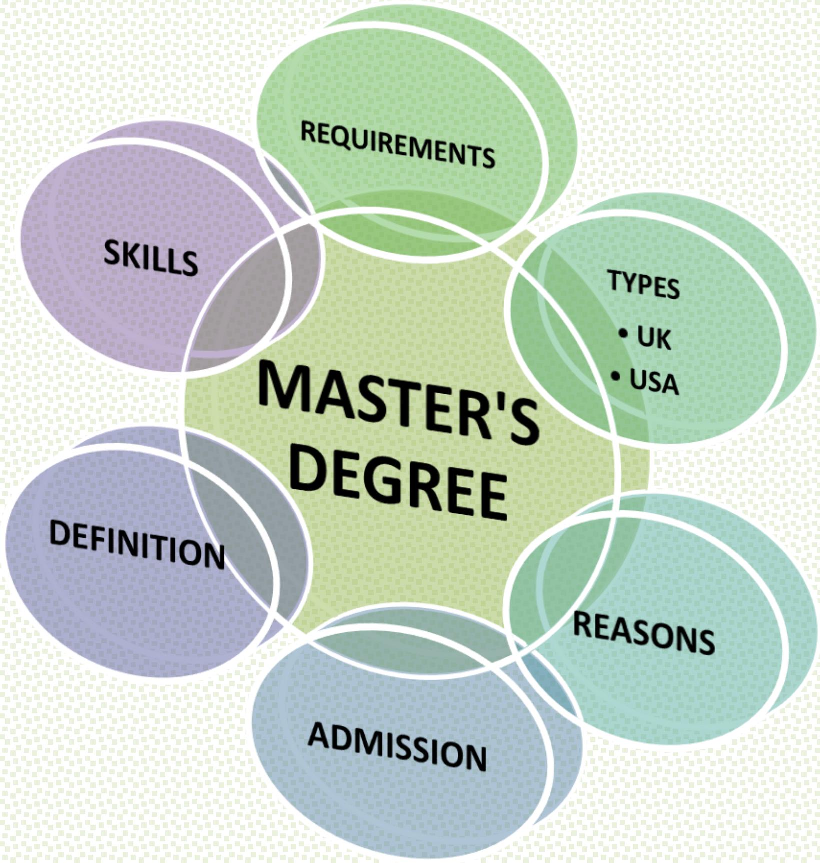
F. You believe an extra qualification can help you stand out from first-degree graduates and impress employers. A master’s degree can indeed increase your knowledge, personal and professional skills and perhaps even boost your confidence, and consequently your employability. A master’s degree qualification can also assist you in securing funding for PhD study.

G. You have the necessary motivation, determination and tenacity to take on the challenge of intense, continued study concerning a higher level of knowledge. Indeed, there is a steep learning curve between a first-degree (such as an associate’s or bachelor’s degree) and a master’s degree. A master’s degree involves an increased workload, a considerably more complex and sophisticated level of work, broader and more independently sourced research, a closer relationship with your course tutor and high professionalism, and excellent time management. And, unlike first degree students, master’s degree candidates should have a specific grasp of their own academic interests and a clearly targeted passion for their subject before they apply.

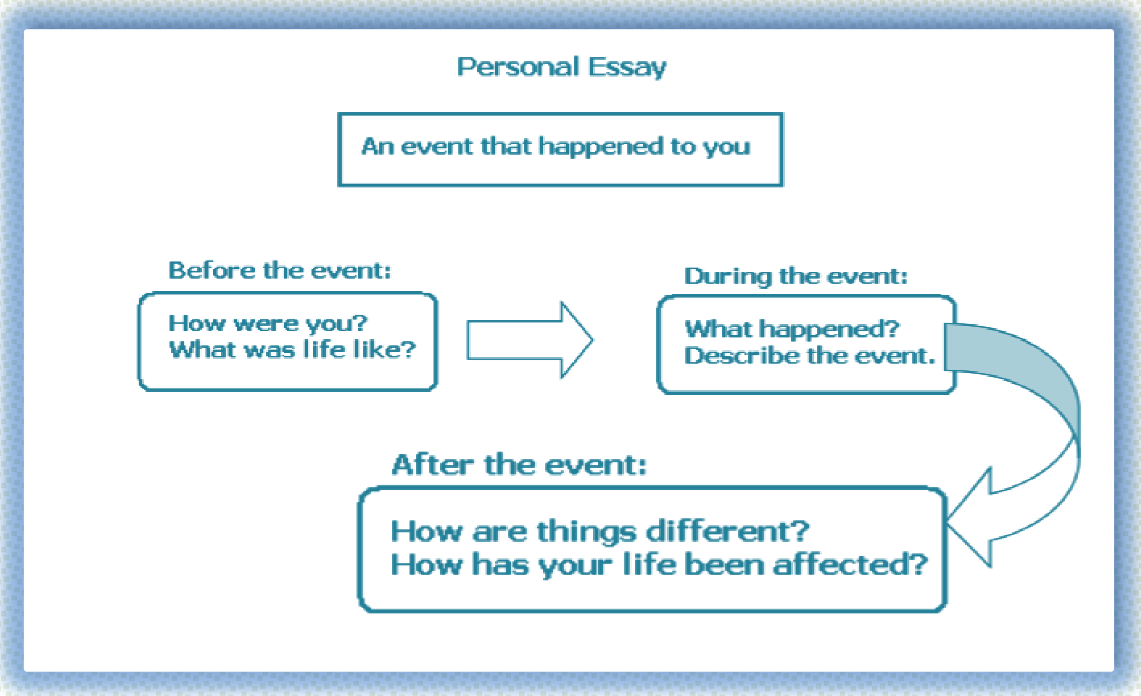
H. You wish to stay in university as long as possible, either because you love university life or are unable to make a decision about your future and want to explore more about your chosen subject before entering the working world. You may stay in academia professionally if you wish, by contributing to research in a university department. If that’s your goal, it may help to start exploring possible job options during your studies so you’re better prepared for life after graduation.

I. You wish to gain a clearer insight into your own industry, or into an industry you wish to enter, and to create invaluable contacts within the industry. Many master’s degree programs offer the chance to network regularly with key industry players and offers work experience opportunities.

6 Summarize the information from the text and get ready to speak about a master's degree. Use the mind map given below.



7 Write a personal essay on the topic "How I decided to be a master student". Make use of the given plan.



8 **Your English colleagues are interested in the system of higher education in the Republic of Belarus. Read the dialogue and find the answers to the questions they would like to ask you. Role-play the dialogue.**

1. How can a school-leaver of be enrolled in a higher education institution?
2. Do Belarussian students pay for tuition?
3. Who is given preference when being admitted to the University?
4. What is required in order to attain a Candidate's degree?
5. How is a Doctor's degree awarded?
6. What kind of research is carried on at the research institutes of the Academy of Sciences?
7. What are the most outstanding contributions of the Belarussian science?

A TALK ON POSTGRADUATE EDUCATION

Clark: We would be much obliged, Mr. Panov, if you could possibly say a few words about educational facilities for young people in your country.

Panov: With pleasure. I'm glad to have this opportunity of telling you about it. Higher education in Belarus is offered by public and private higher education institutions. School-leavers can be admitted in an academy, university or college through a system of competitive examinations.

Clark: Do they have to pay for tuition?

Panov: Most of the students do not need to pay for their studies and even receive monthly state grants, though a certain number of young people enjoy a fee-paying education.

Clark: There is another thing we'd like to ask you about. We are particularly interested in the training of researchers in various fields.

Panov: May I speak about universities?

Clark: Do, please.

Panov: Higher education in Belarus is offered in the following fields: Engineering and Technology, Humanities, Pedagogy and Vocational Education, Art and Design, Natural Sciences, Environmental Sciences, Security Services, Social Protection, Communications, Economics, Law, Management, Economics and Industrial Engineering, Health Care, Forestry and Agriculture, Tourism and Hospitality, Architecture and Construction, Consumer Services and Catering.

Clark: What are the main higher education qualifications?

Panov: Higher education in Belarus is divided into 2 stages. The first stage allows the students to get a specialist's diploma in a certain field of expertise and specialization. After four years of study a university graduate will leave with the higher national diplomas.

Clark: And what about the second stage?

Panov: This stage of education is for advanced students who are interested in research. It provides knowledge and skills in research, pedagogical and scientific studies. This stage concludes with master's degree graduation, and obtaining a master's diploma. At this higher education level, students are required to present and defend a thesis. Students who hold this qualification are eligible for postgraduate studies.

Clark: Could you tell us about post graduated education and science degrees you can get in your country? We have a rather vague idea about them.

Panov: Postgraduate education in Belarus can be regarded as the third stage of higher education. This stage has two-degree levels. The first level is Candidate of Sciences and the second level is Doctor of Sciences. The first degree requires students to complete and publicly defend a thesis and also appear for special exams. The degree of Candidate of Sciences requires three years of postgraduate studies, sometimes a mush longer period of research activities. Every postgraduate working research problem is provided with an adviser. Candidate's degree is approximately to your PhD degree, I believe.

Clark: You also mentioned the second degree in science – Doctorate. How is this awarded?

Panov: Students who hold Candidate of Science degree can go for this qualification studies. After completion of the research studies, students are awarded the degree of Doctor of Science. This degree is awarded by the higher qualification commission of leading scientists and scholars for some original research and a new contribution to science. This is the highest scientific qualification in Belarus.
Students are required to publicly defend a doctorate thesis.

Clark: Could you tell us a little about the Academy of Sciences?
As far as we know you belong to it.

Panov: Yes, I do. The Academy of Sciences is the largest scientific institution in the Republic of Belarus. The progress of Belarusian science and its achievements in various fields of knowledge are under the auspices of the Academy.

Clark: So, the Academy is the centre of your science, isn't it?

Panov: That's right. There is a network of research institutes sponsored by the Academy. The Academy has also greatly contributed to world science.

Clark: Yes, we are well aware of these facts and it's good that a considerable start has been made in our scientific cooperation.

9 Suppose you are talking with your foreign colleague. What would you tell him about the following?

A) Educational facilities for young people in the Republic of Belarus

• ***USE:*** have the opportunity (chance) of...; several types of schools: secondary, technical, vocational; compulsor secondary education; higher education; be enrolled in (be admitted to, enter) the university (institute); higher educational establishments: universities (technical colleges); take(pass) entrance (competitive) examinations; fail an examination; give preference to...; pay for tuition; tuition (education) is free; get a (higher) scholarship; school-leaver; applicant; apply for admission to...

B) The training of researchers in various fields and the science degrees in the Republic of Belarus

• ***USE:*** train researchers in the humanities (sciences, social sciences); get a diploma; work in different fields (of); work hard on...; hit upon an interesting problem; make considerable progress in...; prepare for; take a postgraduate course in...; do postgraduate studies (research); get (obtain, be awarded) a degree; research activity (problem, work); submit a thesis for defence; write, read (defend) a thesis; public defence; the degrees in science are awarded by ...; two degrees: Candidate and Doctorate; original research; make a contribution to...

C) Research and scientific cooperation in your field of science

• ***USE:*** belong to; largest scientific institution; pure (applied) science; progress (achievements) of science in different fields of knowledge; contribute (make contribution) to physics (space research, etc.); research sponsored by ...; under the auspices of ..., make a considerable start in ....; welcome the development of scientific contacts (joint work); do coope-rative research; exchange ideas; international cooperation in various arms of science (engineering).

10 Approach somebody with a request.

1. Ask Dr. Clark to say a few words about higher education in Great Britain.
2. You want to know about the scientific degrees granted in Great Britain.
3. You want Dr. Stepanov to tell you about post graduate research.
4. You would like to know about a Doctor's degree in Great Britain.
5. Find out about the training of researchers in sciences as well as in humanities.
6. You would like to know when the candidate examinations in English are to be held.
7. You are interested in the standards of admission to British Universities.
8. Ask your British colleague about PhD degree.

Some helpful phrases:

Will you (please) . . .? Be so kind as to . . . Would you (please) . . .? Would you kindly . . .? Could you possibly . . .? / would be much obliged if . . .

REPLIES:

Certainly, of course, with pleasure, most willingly, I'm afraid I can't, sorry I can't.

11 **Role-play the situations.**

Your British or American colleague has arrived in Minsk. Ask him all possible questions about the system of education in his country.

Discuss with your colleagues what should be done to recieve the degree of Candidate of Sciences.

UNIT II

SCIENTIFIC ACHIEVEMENTS IN AGRICULTURE

§ 1

THE SCIENCE AND TECHNOLOGY OF AGRICULTURE

☐ ***Read***

☐ ***Speak***

☐ ***Write***

1 **Skim the text. Create the "big picture" or main idea of the text. Find an appropriate heading for each paragraph.**

New Ways of Farming

Conserving Resources

Impact of Progress on Agriculture

Spreading New Ideas

1____

Throughout history, scientific and technological advances have greatly impacted the agriculture industry. Early farmers improved their crop production by inventing the first hoes. Today, farmers improve crop production through the use of global positioning systems (GPS).

Early advances were shared by word of mouth. In more recent times, scientists studying at universities devote their lives to research and development of farming products and practices. Farmers and agricultural scientists have benefited and contributed to the ever-evolving science of agriculture.

2____

By the latter part of the 19th century farmers had learned to diversify their crop production and to raise livestock for profit. Farmers had learned the value in planting corn and feeding it to fatten their livestock.

Advances in farm machinery production changed the way farmers worked. They were able to cover more land at a faster pace; and as manufacturers added seats to farm machinery, farmers found some relief from their backbreaking labors.

The development of better corn seed is one of the biggest improvements in the past 100 years. Farmers once shelled the kernels from the longest and best-looking ears from the harvest and planted those kernels the next spring. However, plant scientists like Henry A. Wallace began experimenting with ways to produce even better seed. They learned how to use the pollen from one variety of corn to fertilize another variety to produce a hybrid. The new variety grew ears that were better than either of its "parents." In the 1930s many farmers began buying hybrid corn seed. Today nearly all corn planted in the United States and much of the rest of the world is some hybrid variety.

3____

A number of institutions were established to encourage agricultural advances. State and country fairs were held and became show places for the best in all areas of agriculture. They helped spread the news about new ideas and methods. And they encouraged farmers to develop new products and new ways of doing their work.

Interests in agricultural advancement also were reflected in the early provision for a state agricultural college and model farm to promote better farming techniques.

The invention of radio and television made it possible for farm families to learn about new ideas. They learned about new kinds of technologies such as food-freezing processes that revolutionized food storage. They also learned about hybrid seed that boosted crop production, and soybeans that became a major crop addition. New ways of spreading information allowed farm families to hear about soil conservation programs also. They learned about cattle and hog breeding which in turn improved the livestock industry.

4____

Over the years, farmers have become more aware of conservation methods to prevent erosion and to protect the water. Some farmers have planted buffer strips – wide strips of grass – along waterways. These grassy strips trap soil and chemicals before they reach the water. Many farmers have changed plowing practices – plowing their fields less often and not as deep. This helps to keep soil from blowing away.

All these advances in the area of science and technology have resulted in fewer farmers working bigger farms. Many farmers use global positioning systems and agree that it is a new form of technology that benefits farmers. But advances in biotechnology and crop production have caused controversy.

2 **Read the text again and make a list of the new words which you think will be useful for you in the future. Give:**

- **definitions of the words**
- **indication of whether they are nouns, verbs, adjectives etc.**
- **phrases in which the word occurs**
- **other words with the same meaning**
- **other forms of the words**

3 **Define a few key words in your word journal. Recommend your partner to practise them in his/her own sentences.**

4 **Work in groups. Write the questions devised by reporters: Who, What, When, Where, Why and How. Ask your partner the questions you wrote to probe the content of the text.**

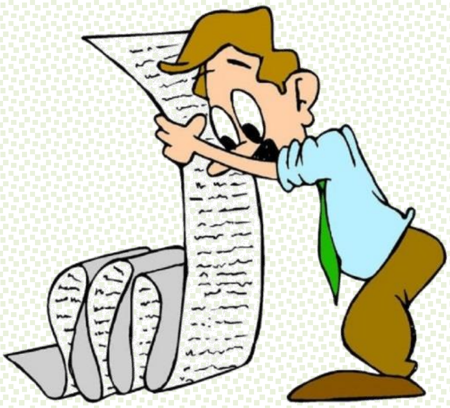
5 **Tick if the following statements are true (T) or false (F). Correct the false ones. Give arguments using the information from the text.**

?	T	F
1. The first hoes as well as GPS are the exaples of scientific and technological advances of their time in agriculture.		
2. Advances in farm machinery production helped farmers to cover only more land at a faster pace.		
3. The development of better seed potatoe is one of the biggest improvements in the past one hundred years.		
4. State and country fairs helped spread the news about new ideas and methods.		
5. The changes in plowing practices help prevent erosion.		

6 **Work in small groups and discuss the following:**

1. The role of scientific and technological advances in agriculture thgoughout the history.
2. The importance of radio and television invention for agriculture.
3. Land conservation methods have changed due to scientific and technological advances.

7 **Summarize all the necessary information from the text and write down an expanded summary. Express your attitude to the text. Elicit the information from the text and use additional information from your general knowledge or any other source of information.**



§ 2

THE ROLE OF INNOVATIONS IN AGRICULTURE

☐ ***Read***

☐ ***Speak***

☐ ***Write***

1 **Look at the title of the text and ask yourself:** *What is the text about?* **Skim the text very quickly to get a general impression. Read the text. Pay attention to text features like the introduction, main body and conclusion. Establish their purpose.**

Agriculture nowadays is about so much more than a farmer simply planting a seed, rearing a cow or catching a fish. It takes a whole ecosystem and a host of actors to work together to produce the food we need for a population of more than seven billion people.

This complex agricultural production system has evolved over time through scientific discoveries and other innovations. Advances in technology and farming practices have helped farmers become much more productive, growing crops efficiently in areas most suitable for agricultural production. Without these advances, far more land would need to be cultivated to produce the food we need today. For instance, it has been estimated that we could produce the same amount of total food grown fifty years ago on less than one-third the amount of land used back then. If yields had stayed the same, we'd need to cultivate more than double the amount of land to feed the population today – a shift from 12.2 billion acres to at least 26.3 billion acres.

Innovation is not only driven by technological advances, but also through novel ways of organizing farmers and connecting them to the information they need.

Many smallholder farmers around the world still farm the same way their ancestors did thousands of years ago. Traditional farming approaches may continue to work for some, but new practices can help many to substantially improve yields, soil quality and natural capital as well as food and nutrition security.

Sometimes, innovations to address these issues are taken to farms via extension training. Farmers themselves can be organized in innovative ways so they are reached more easily and effectively with information. The type and style of the extension itself has evolved much over time. For instance, advances in satellite mapping and information and communications technologies (ICTs) are transforming more traditional agricultural extension work today. Farming is becoming more precise and productive as a result. The quality, availability and proper use of agricultural inputs is at the heart of agricultural production and sustainability.

The crops that are grown today have been bred over the past ten thousand years to be quite distinct from their wild ancestors. Maize, for instance, has evolved from a species called teosinte, which is native to Mesoamerica. Similarly, modern wheat is the result of farmers in the Near East selecting for mutations which resulted from the natural crossing of different species of wild grass.

Farmers today are faced with a changing climate, which demands seeds that can cope with increased incidents of droughts, heatwaves, floods and elevated salinity levels. This is happening while arable land per capita is ever decreasing, which compels farmers to maximize harvests on existing land. To do this, the right inputs need to be used in the right amount and at the right time, in the right location. This is called the 4Rs, and is an integrated part of best management practices for improved and more efficient fertilizer application. For example, in more developed countries, global positioning systems (GPS) are helping farmers to track their use of fertilizer and match it very precisely to various soil types on their farm. It can also help them to identify potential pest or disease outbreaks.

Without pesticides and other pest controls, an estimated 70% of the world's crop might be lost, rather than 42% today. This would require substantially more cropland being brought into production to make up for this loss.

Resilience' describes whether a farmer (and her farm) is able to withstand or recover from stresses and shocks. 'Stresses' are regular, sometimes continuous, relatively small and predictable disturbances (e.g. lack of access to inputs, a declining natural resource base, climate change and poverty) while 'shocks' are irregular, relatively large and unpredictable (e.g. floods, droughts, heatwaves and price volatility).

For farmers to be resilient, they must be able to bounce back from these challenges and achieve previous levels of growth – rather than suffer from reduced yields over time or even worse, a collapse in their production. Climate change already poses a risk, especially to smallholder farmers in the developing world.

Market access allows farmers to buy the inputs they need such as improved seeds and fertilizers, and also to bring their crops, livestock and fish to market to earn a living.

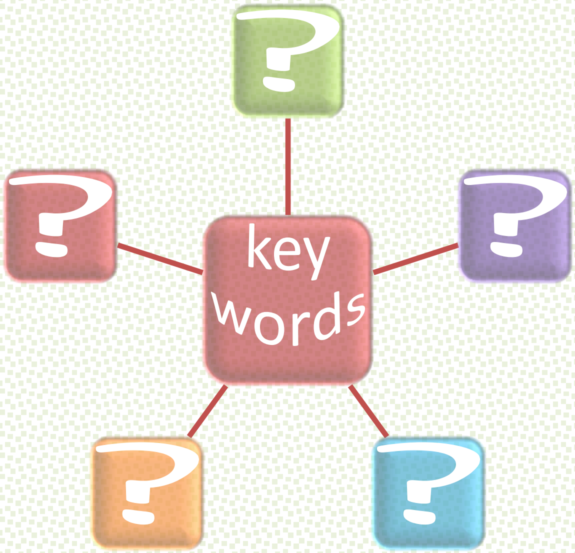
Millions of smallholder famers live in remote areas, and are often isolated from market opportunities. Innovations in connecting these farmers to market are happening in many ways – resulting from social, technical and scientific advances. These advances help farmers find and share up-to-date market pricing information; protect and add value to their harvests; invest in their business; reduce and share risk; and access finance and training.

These innovations can be used and accelerated by actors all across the agricultural value chain to reduce transaction costs and risk while helping to give farmers equal access to the opportunities that exist through trade.

2 **Make a list of the new words which you think will be useful for you in the future. Give:**

- ☐ definitions of the words
- ☐ indication of whether they are nouns, verbs, adjectives etc.
- ☐ phrases in which the word occurs
- ☐ other words with the same meaning
- ☐ other forms of the words

3 **Define a few key words in your word journal. Recommend your partner to practise them in his/her own sentences.**



4 **Work in groups. Write the questions devised by reporters: Who, What, When, Where, Why and How. Ask your partner the questions you wrote to probe the content of the text.**

5 **Working with a partner, brainstorm ideas for the following:**

1. Modern agriculture is a complex system.
2. Innovation is determined by technological advances, as well as through new ways of organizing farmers and connecting them to the information they need.
3. The crops that are grown today can cope with increased incidents of a changing climate.
4. Innovations play a very important role in connecting smallholder farmers to markets.

6 **Prepare an outline for the text "*The role of innovations in agriculture*", using the following key word combinations:**

a host of actors	technological advances	innovations	opportunities
agricultural production system	smallholder farmers	farming practices	innovative ways

OUTLINE

Topic: ….

1. Introduction
   - 1.1 Definition of the topic
   - 1.2 Significance of the Study
   - 1.3 Definition of Terms
2. Body
   - 2.1
   - 2.2
   - 2.3
3. Conclusion
   - 3.1 Conclusion
   - 3.2 Recommendations

7 **Summarize all the necessary information from the text and write down an expanded summary. Express your attitude to the text. Elicit the information from the text and use additional information from your general knowledge or any other source of information.**

§ 3

INNOVATIVE AGRICULTURAL PRACTICES

☐ ***Read***

☐ ***Speak***

☐ ***Write***

1 **Establish your purpose for reading: narrative = for literary experience / enjoyment; expository = for information; functional = to perform tasks / follow directions; educational = to improve reading skills, etc.**

2 **Preview the text to get an idea of what it is about without reading the main body of the text.**

3 **Predict the contents of the text and write questions about it.**

QUESTIONS BEFORE READING

Predictions

1.____?
2.____?
3.____?
4.____?
5.____?

1. Nowadays there is a wide new frontier for science and innovation in agriculture. There are many ways to grow food and fiber, and so much to learn about the science of growing crops or breeding animals. Modern farming is full of opportunities for agricultural partnerships with scientists in fields that range from biology to robotics.

2. Digitization of the modern world means that almost every contemporary field or industry is becoming more and more dependent on hardware connected to and, in some cases, controlled by software. These industries are being transformed from the inside out by innovative technology and practices. Agriculture is a prime example of one of these industries. It has experienced a massive technological shift.

For example, precision agriculture involves big data, drones, sensors, and farm management software. Environmental controls, cellular agriculture (micro farms), smart packaging technology, gene manipulation, and e-grocer businesses have also pushed the entire agricultural business world into the computer age. These innovative practices and technologies may very well prove to be more than just the future of farming and agriculture. They may be the very keys to the survival of the human race. Let's consider some innovative agricultural practices and technologies that are changing the world.

3. *Urban Agriculture, Smart Design, and Vertical Farms*. The big advantage that urban farming touts is the innovative reimagining and utilization of space. Urban farms might be as humble as your traditional, outdoor community garden. On the other hand, they might be as complex and futuristic as well-regulated, self-contained, environmentally controlled pods that are stacked on top of each other.

4. Vertical farming is one of the latest trends in urban farming. It began to produce yields that are nearly 10 times more efficient than traditional agriculture. Vertical farming doesn't promise to change radically the way of farming, only make it more efficient, productive, and take up less space. More space means more energy that's needed for heat and light, which in turn makes for higher costs and more wasted resources. Instead of building a larger structure, vertical farmers adopt the tenets of designing an efficient space to reduce waste and increase yield.

5. *The Drones & the Bees*. Climate change is a massive problem for human beings that, perhaps, haven't been fully realized yet. One of the problems that everybody seems to be familiar with is the problem of disappearing bees. This could spell disaster, as bees play an important economic role as pollinators helping sustain agricultural production. Fortunately, drones are now being used in experiments to supplement the pollination efforts that bees have traditionally completed.

6. The Beak & Skiff Apple Orchard in LaFayette has become the first apple orchard in the world to pollinate its trees using a drone, according to the start-up company that developed the technology. Pollination aside, there are plenty of ways that agriculture could utilize drones, including aerial drone photography for a quick look at fields, automated crop harvest, and even as delivery drones in the future.

7. *Artificial Intelligence, IoT, and Automation*. Progress is being made in the development of self-driving tractors. Artificial Intelligence (A.I.) is doing the driving. Functional driverless tractor technology in the form of "AutoCart" software is one of the important technologies. This software application fully automates a grain cart tractor, which provides farmers much needed assistance during the demanding harvest season. The innovative technology will allow farmers to automate their existing equipment and maximize its efficiency and capacity regardless of manufacturer.

8. The AutoCart software is actually a cloud-based platform, meaning that these automated agricultural vehicles will join the worldwide internet of things (IoT). Automated vehicles are just one facet of machine learning and IoT innovation in agriculture. It is reported that Chinese farmers have recently begun testing a new AI system that uses a combination of machine vision, voice recognition, and temperature sensors to keep track of pigs' location, health, and wellbeing. Other use-cases include advanced detection of diseases in crops using many of the same techniques.

9. *Cloud-based nitrogen advisors*. This technology offers real-time nitrogen fertilizer advice, based on weather conditions, that is specific to field zones and thereby allows farmers to more precisely match nutrient additions with crop needs. In on-farm field evaluations, this technology has proven to offer a win-win opportunity: it increases farmers' profits while reducing negative environmental impacts. Moreover, the high scalability of cloud-based services allows the technology to be rapidly employed in many growing environments. Employment at scale allows for dramatic reductions in per-unit (hectare) expense and can drive down adoption costs. Cloud-based and mobile communications allow for continuous access and real-time monitoring of the status of farm resources.

10. *CRISPR and Genetic Editing.* Scientists have recently begun utilizing CRISPR/Cas9 (clustered regularly interspaced short palindromic repeats) to do precise genetic operations allowing them to target and alter the genome of an organism by cutting out or replacing specific parts of a DNA strand's genetic sequence. Now, CRISPR is being used to change a cow's gut microbes to try and reduce the amount of methane they are producing as well as how large they get. Scientists have also begun engineering crops that require less water and that grow more food. Of course, there could be unforeseen consequences when it comes to messing with genetics in any environment or ecosystem. Scientists have to be extremely cautious not to create more problems in an attempt to solve a few.

11. These are just a couple of ways that innovative agricultural practices are changing our future, and making the world a more liveable place. Research provides the reliable knowledge that helps farmers succeed – whether it takes the form of peering through a microscope at tiny insects, hiking through a field collecting soil or water samples, or analysing trends in crop acreage or commodity prices.

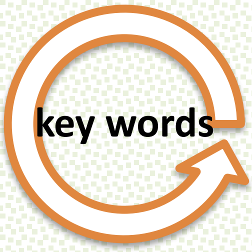
4 **Have you found answers to the questions you wrote before reading the text? What are they?**

5 **Make a list of the new words which you think will be useful for you in the future. Try to use them in your own sentences. Give:**

- definitions of the words

- indication of whether they are nouns, verbs, adjectives etc.
- phrases in which the word occurs
- other words with the same meaning
- other forms of the words

6 **Define a few key words in your word journal. Recommend your partner to practise them in his/her own sentences.**



•?__________

•?__________

•?__________

•?__________

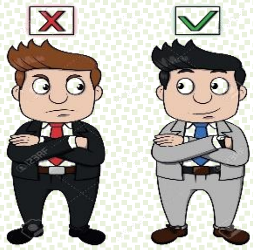
•?__________

7 **Read the text again and fill in the table below. Compare your results with your partner.**

Paragraph of the text	✔ I know	+ New information	- I think differently	? Need to learn more	! Controversial point
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					

8 **Work in groups. Write the questions devised by reporters: *Who, What, When, Where, Why and How*. Ask your partner the questions you wrote to probe the content of the text**

9 **Read the following statements. Do you agree with them? Give arguments using the information from the text.**



1. There are a lot of opportunities for science and innovation in agriculture.
2. Agricultural innovative technologies and practices are closely connected with digitization.
3. The future of farming and agriculture doesn't depend significantly on innovative practices and technologies.
4. Urban farming and vertical farminng have no differences.
5. Drones are now being used to pollinate trees.
6. Self-driving tractors are just a myth not a reality.
7. Recent technological developments offer more reliable nitrogen management advice to farmers.
8. Scientists are not sure about the possibilitities to alter the genome of an organism.
9. Scientists helps farmers succeed.

10 **Fill in the chart and get ready to speak about advantages of agricultural innovative technologies. Use the text for reference.**

Urban Agriculture	•… •…
Vertical Farms	•… •…
The Drones	•… •…
Artificial Intelligence	•… •…
Cloud-Based Nitrogen Advisors	•… •…
CRISPR and Genetic Editing	•… •…

11 **Summarize the information from the text in writing and get ready to speak about innovations in agriculture. Express your attitude to the text.**

12 **Guess the ten agricultural innovations and briefly describe them. Use the information from the text, your personal knowledge or any other source of information that is coherent to the topic. Discuss with your partner.**

INNOVATION	PURPOSE
	Save farmers' time and give cows the freedom to be milked when they want
	Save farmers' money and consistently feed a herd
	Increase pregnancy rates
	Identify domestic livestock
	Spot weeds, calculate fertilizer needs and scare pigeons
	Monitor, display and record grain yield
	Manage all aspects of the farm
	Communicate, check soil depth, register animals and so on
	Save farmers time
	Guide tractors in straight lines to save seed, fertilizer and fuel

PROMPTS:

Driverless tractors // aerial drones // robot milking machines // farm management softwear // combine harvester yield meters // cow heat detection devices // robot livestock feeders // electronic ear tags

13 **Read the quotations given below. How can you comment on them? What do you know about these people? What are they famous for? Try to imagine what the author had in mind when they worded the quote. Think what could've affected their viewpoint.**

1. Innovation is not the product of logical thought, even though the final product is tied to a logical structure. (*Albert Einstein*)
2. Innovation distinguishes between a leader and a follower. (*Steve Jobs*)
3. For good ideas and true innovation, you need human interaction, conflict, argument, debate. (*Margaret Heffernan*)
4. Changes call for innovation, and innovation leads to progress. (*Li Keqiang*)
5. Creativity is thinking up new things. Innovation is doing new things. (*Theodore Levitt*)

UNIT III

MASTER'S SCIENTIFIC RESEARCH

MASTER PROJECTS

§1

THE STEPS OF THE SCIENTIFIC RESEARCH

☐ ***Read***

☐ ***Speak***

☐ ***Write***

1 **Read the text. Pay attention to text features like the introduction, main body and conclusion. Establish their goals and purpose.**

The research process deals with the ways and strategies used by researchers to understand the world around us. There are many types of research methods such as quantitative, qualitative, scientific. Different methods are used depending on the type of research being pursued. All research methods in science are based on the scientific method. The scientific method is a process for experimentation that is used to explore observations and answer questions, to collect measurable, empirical evidence in an experiment related to a hypothesis (often in the form of an if/then statement), the results aiming to support or contradict a theory. This method is important since an individual's beliefs can influence how to interpret certain phenomena. By using these specific methods, researchers can reduce mistakes based on their own biases or prejudices. When direct experimentation is not possible, scientists modify the scientific method. In fact, there are probably as many versions of the scientific method as there are scientists! But even when modified, the goal remains the same: to discover cause and effect relationships by asking questions, carefully gathering and examining the evidence, and seeing if all the available information can be combined in to a logical answer.

The scientific method is the basis of any scientific work of masters' students. Whether you are doing a science fair project, an independent research, or any other hands-on science inquiry understanding the steps of the scientific method will help you focus your scientific question and work through your observations and data to answer the question as well as possible. The scientific method has six primary components.

The process begins with *a basic observation and description* of a phenomenon. Observations lead researchers to have *questions* about why certain phenomena occur. Researchers then put forth *a hypothesis*, or prediction, of what will happen or what the outcome of certain phenomena will be. The hypothesis must be testable and falsifiable. Falsifiable means that there must be a possible negative answer to the hypothesis. Researchers then conduct specific types of *experiments* meant to prove or disprove this prediction. Experiment tests whether a scientist's prediction is accurate and thus his hypothesis is supported or not. An experiment should include a dependent variable (which does not change) and an independent variable (which does change) and an experimental group and a control group. The control group is what the experimental group is compared against. It is important for an experiment to be a fair test. Researchers conduct a fair test by making sure that they change only one factor at a time while keeping all other conditions the same.

Once your experiment is complete, you *collect your measurements and analyze* them to see if they support your hypothesis or not. Scientists often find that their predictions were not accurate and their hypothesis was not supported, and in such cases, they will communicate the results of their experiment and then go back and construct a new hypothesis and prediction based on the information they learned during their experiment. This starts much of the process of the scientific method over again. Even if they find that their hypothesis was supported, they may want to test it again in a new way. Although the scientific method is shown as a series of steps, it should be kept in mind that new information or thinking might cause a scientist to back up and repeat steps at any point during the process. A process like the scientific method that involves such backing up and repeating is called an iterative process. In other words, it's a cycle rather than a straight line. The result of one go-round becomes feedback that improves the next round of question asking.

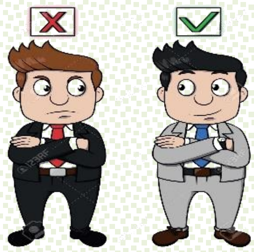
To complete a science project, a master student will *communicate* his results to others in a final report or a master's thesis and/or a display board. Professional scientists do almost exactly the same thing by publishing their final report in a scientific journal or by presenting their results on a poster or during a talk at a scientific meeting. In a science fair, judges are interested in the findings regardless of whether or not they support original hypothesis.

Scientific method produces answers to questions posed in the form of a working hypothesis that enables us to derive theories about what we observe in the world around us. Its power lies in its ability to be repeated, providing unbiased answers to questions to derive theories. This information is powerful and offers opportunity to predict future events and phenomena. Ultimately the scientific method enables us to get closer to the truth because we can provide evidence, tested through experimentation, that proves whether or not a theory can be considered true or false. This is called the 'scientific paradigm' and it gives us the best insight into how the universe really is. However, science is certainly not infallible and no self-respecting scientist would ever claim it to be. Indeed, once a theory is published science is then used rigorously to try to disprove rather than support it. The point is that by trying to disprove a theory and failing to do so, the more likely it is that the theory is indeed correct. The scientific method has evolved to try and make scientific research as objective as possible. It is a self-regulating process that tends to remove bias far more than other approaches. This is essential for establishing objectivity and, thereby, greater validity. The scientific method is important to scientists because it provides a universal objective process that allows theories to be evaluated in light of the evidence and either verified or rejected. The scientists can get closer to the truth.

2 **Read the text again and write down any new or difficult words. Look these words up in a dictionary and try to use them in the sentences of your own.**

3 **Work in groups. Write the questions devised by reporters: Who, What, When, Where, Why and How. Ask your partner the questions you wrote to probe the content of the text.**

4 **Read the following statements. Do you agree with them? Give arguments using the information from the text.**

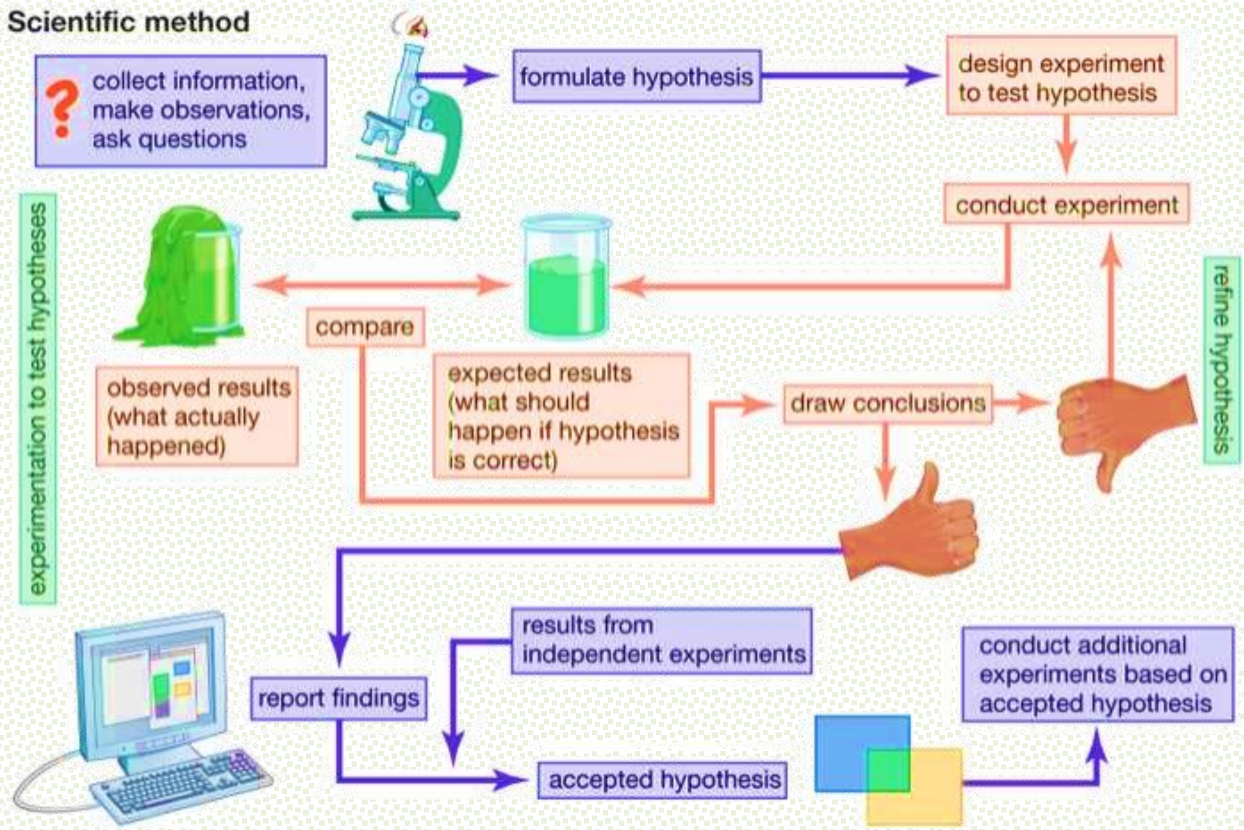


1. There are many types of research methods.
2. With the help of specific methods, researchers can increase mistakes based on their own biases or prejudices.
3. The common chain of a research process is constructing a hypothesis, analyzing data, test your hypothesis, communication of the results, observation and description of a phenomenon, asking questions.
4. An experiment should include a dependent variable and a control group.
5. Even if predictions are not accurate and a hypothesis is not supported scientists communicate the results of their experiment.
6. New information or thinking might cause a scientist to back up and repeat steps at any point during the process.
7.The results of the research are presented on a poster or during a talk at a scientific meeting.
8. The scientific method is important to scientists.

5 **Work in small groups and discuss the following:**

1. In science, a theory is the framework for observations and facts.
2. Some scientists do not follow exactly the process for experimentation used to explore observations and answer questions.
3. A good hypothesis allows you to make a prediction.

6 **Summarize the information from the text in writing and get ready to speak about the steps of the scientific methods. Make use of the mind map given below.**



§ 2

USEFULL TIPS

WHAT IS A KEYWORD IN THE TEXT, AND HOW TO FIND IT?

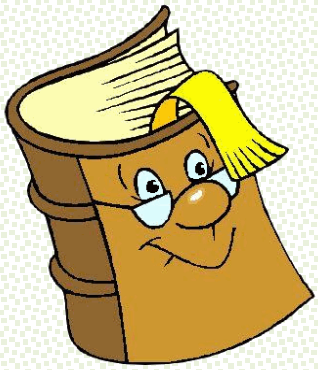
For those who work with the text, it is very important to find keywords in it. If you find the right words in the text, then it will not be difficult to restore the entire text. Key words are the basic fragments of the text that carry the content load of the whole statement and are arranged in a certain order. If they are found and located correctly, then the meaning of the text will be clear and understandable. With these reference fragments, the entire text is easily restored.

A keyword in the text is usually the main member of the sentence, well, at least one of them. If you select a keyword from the stem, then select the one that is associated with the subsequent context. Usually, secondary members are elected in the role of support on this principle – in connection with the following proposal. When we know what a keyword is in the text, you can use this knowledge in the process of compiling a basic summary.

Finding the keywords in an article remains a very important part of the text work. To make your work easier you may make use of the following plan.

STEP 1	•Study the title. If the article is properly organized, the keyword will appear right in the title
STEP 2	•Look at the first sentence. Often an article will contain the keyword in the very first sentence.
STEP 3	•Study the last sentence of the first paragraph. This sentence will often contain either the main keyword or a closely related keyword.
STEP 4	•Skim the entire middle of the article between the first and last paragraph. Look for phrases that appear repeatedly. Especially focus on phrases which also show up in the title or easily relate to keywords in the title.
STEP 5	•Focus on the last paragraph for keywords which also appear in the first paragraph, title, and throughout the rest of the article. The first and last sentences of the last paragraph of an article will most often contain the main keywords, or closely related keywords.

HOW TO IMPROVE YOUR READING SKILLS



Improving your reading skills will reduce unnecessary reading time and enable you to read in a more focused and selective manner. You will also be able to increase your levels of understanding and concentration.

To improve your reading skills, you need to have clear reading goals. Use reading goals to select and prioritize information according to the task in hand.

- choose the right texts. Make sure you understand the type of a text you have. Is it information-based, like a newspaper, textbook, or manual? Or is it more creative / artistic, like a novel or short story? This is important.
- use the right reading style;
- use note taking techniques.

Once you have selected a text you can use the following techniques:

1. Scanning. Scanning is the technique you might use when reading a telephone directory. You pass your vision speedily over a section of text in order to find particular words or phrases that are relevant to your current task. You can scan:

- the introduction or preface of a text;
- the first or last paragraphs of chapters;
- the concluding or summarising chapter of a text;
- the book index.

2. Skimming. Skimming is the process of speedy reading for general meaning. Let your eyes skip over sentences or phrases which contain details. Concentrate on identifying the central or main points. Use this technique to:

- pre-view a selection of text prior to detailed reading;
- refresh your understanding of a selection of text following detailed reading.

3. Intensive reading. Read intensively if you want to practice the fundamentals and learn vocabulary. Intensive reading is the technique focused more on individual details of what you're reading like spelling, pronunciation, and the rhythm of sentences. If you want to practice pronunciation, study grammar, or learn vocabulary, you'll want to read more slowly and focus more on individual words and sentences. It's not always important to worry about what something means in a deep way. Just try to get a general sense of what the reading is about. As you read, you'll focus more on details.

Reading out loud can improve your reading skills because it makes you be involved with the text in two ways: with your eyes, as you look at the words, and with your ears, as you listen to them. Reading out loud is also important if you're trying to practice pronunciation.

When you come to a word you don't know, try not to reach for the dictionary right away. Instead, try to guess the meaning of the word based on the context. If you still can't understand the words, write them down and look up their meaning in a good dictionary. That way, you can study the words later, too.

It is important to read as often as you can. The more you read, the easier it becomes. Practicing for at least 15 to 30 minutes a day, every day, will make a big difference

4. Extensive reading. Try extensive reading technique if you're looking for understanding. Extensive reading works when you're trying to determine the meaning of what you're reading. This technique focuses on the overall picture. It's best for things like studying a textbook, reading a newspaper article for information, or reading a book for studies.

There are many reasons why extensive reading is good for language development.

Extensive reading builds vocabulary. When learners read a lot, they meet thousands of words and lexical (word) patterns that are not taught in textbooks. Extensive Reading allows the learner to develop an awareness of collocations (common word partnerships) and thousands of lexical phrases.

Extensive reading helps learners understand grammar. In textbooks learners meet hundreds of grammar patterns. However, textbooks do not provide enough meetings with grammar for real acquisition to occur. Extensive reading provides opportunities to see grammar in context so learners can deepen their understanding of how grammar is really used.

Extensive reading helps learners to build reading speed and reading fluency. In particular, developing reading speed is important because it helps learners to understand language faster and better.

5. Note taking techniques. If you want to read to understand something on a deeper level note taking techniques provide a useful aid to reading.

Use:

- underlining and highlighting to pick out what seem to you the most central or important words and phrases. Do this in your own copy of texts or on photocopies – never on borrowed texts;
- keywords to record the main headings as you read. Use one or two keywords for each main point. Keywords can be used when you don't want to mark the text;
- questions to encourage you to take an active approach to your reading.

Record your questions as you read. They can also be used as prompts for follow up work;

- summaries to check you have understood what you have read. Pause after a section of text and put what you have read in your own words. Skim over the text to check the accuracy of your summary, filling in any significant gaps.

These techniques encourage an active engagement with the text as well as providing you with a useful record of your reading. Avoid passively reading large amounts of text; it does not make effective use of your time. Always use a note taking technique to increase your levels of concentration and understanding.

5 Reading Comprehension Tips

Reading comprehension is the understanding of what a particular text means and the ideas the author is attempting to convey. Reading comprehension is an intentional, active, interactive process that occurs before, during and after a person reads a particular piece of writing.

There are two elements that make up the process of reading comprehension: vocabulary knowledge and text comprehension. In order to understand a text the reader must be able to comprehend the vocabulary used in the piece of writing. If the individual words don't make the sense then the overall story will not either.

Text comprehension is much more complex and varied that vocabulary knowledge. Readers use many different text comprehension strategies to develop reading comprehension. These include monitoring for understanding, answering and generating questions, summarizing and being aware of and using a text's structure to aid comprehension.

Improving your vocabulary and increasing the amount of time you spend reading overall will help you to improve your reading comprehension over time, but what do you do to help you to comprehend a particular piece of text? The following tips will help to understand the text:

TIP 1	Stop When You Get Confused and Try to Summarize What You Just Read. Keep reading with your summation in mind and let yourself stop and repeat the process whenever the piece becomes confusing to you.
TIP 2	If You're Struggling, Try Reading Aloud. Reading problematic passages aloud can often help avoid that block and help you to form a visual of what the text is trying to convey.
TIP 3	Re-read (or Skim) Previous Sections of the Text. Re-reading these passages will help you to remind yourself of any information you need and have forgotten – what happened previously, what a particular word means, who a person was...the list is endless.
TIP 4	Skim or Read Upcoming Sections of the Text. It can help you to know that explanations are upcoming or even just to read them ahead of time.
TIP 5	Discuss the Text with a Friend trying to teach or discuss what a passage says or means with "someone else" can be extremely beneficial.

HOW TO IMPROVE ENGLISH WRITING SKILLS

Writing skills are an important part of communication. Good writing skills allow you to communicate your message with clarity and ease to a far larger audience than through face-to-face or telephone conversations. Correct grammar, punctuation and spelling are the key in written communications.

Some simple steps to improve your written English:

1. Expand your vocabulary

To express yourself clearly, you need a good active vocabulary. It means being able to use the words correctly not just being able to recognise them. It can be done by learning new words with example sentences, not just word lists.

TIP! When you learn a new word, try learning all the forms of that word and the prepositions that are usually used with it.

2. Master English spelling

You must know how to spell those words correctly. Incorrect spelling changes the meaning of your sentence.

TIP! Practice your spelling using flash cards and test yourself whenever you have some spare time.

3. Read regularly

People often say that we learn to write best by reading. Reading in English is useful in many ways. It is a great way to get an idea of the different styles of writing and see how to use words appropriately.

TIP! Choose books or articles with topics that interest you. Learning shouldn't be boring. Read each text several times to make sure you understand how to use new words and expressions in the text.

4. Improve your grammar

Grammar is very important because it improves the quality of your writing. Always use the appropriate tense and remember to use punctuation. Punctuation is a great way to make your writing clear and fluent.

TIP! Always proof-read your writing twice. The first time, look for general mistakes and the second time look for mistakes with the particular grammar point you are studying at the moment.

HOW TO IMPROVE YOUR COMMUNICATION SKILLS

Communication skill is the art and technique of communicating by using oral and body language. Communication skills are the set of skills that enables a person to convey information so that it is received and understood.

In any language, there are three extremely important points to remember when you're communicating with someone.

1. Say what you mean. It can be difficult to express some ideas clearly, but if you're trying to prevent miscommunication, it's important to say exactly what you mean. Be clear and to the point.

2. Ask questions. Communication is two-way, which means you can't be the one doing all the talking. To make sure your listener is interested in what you have to say and understands you, ask questions.

3. Listen. We mean really listen. Hear what your speaking partner has to say, and try to understand what they mean.

Following all three of these rules will make you excellent at communicating in English (and probably in your native language as well).

5 Essential Tips for Clear Communication in English

1. Know who you're talking to

One of the first things you should work on when looking to improve your communication skills is try to guess who it is you're speaking to when you're communicating.

This includes everything from where they're from to what their personality and emotional temperament are. This affects how you communicate with someone as much as anything, from the language you use to what kinds of stories you tell to communicate a point, so whatever you can garner before and during a conversation can go a long way to improving how effectively you're able to communicate your message.

2. Body language is as important as the words you speak

Body language is, for the most part, automatic and transmits how we're feeling emotionally in any given moment. However, your body language also communicates to others how you're feeling, sometimes communicating emotions we wish not to show – like a lack of confidence.

However, you can influence your own body language, like sitting up straight instead of hunching over, widening your shoulders instead of slouching.

Other basic rules for good body language when communicating include always maintaining eye contact as well keeping an open posture (i.e. not

3. Say just enough to get your point across

crossing the arms and facing your chest towards the person you're speaking with).

People with sophisticated communication skills tend to speak less and listen more. However, when they speak they always seem to communicate their message more clearly than the less sophisticated communicator that trails on and on endlessly.

How do you do that? Before you speak, think about why you're responding to someone, or what you're trying to communicate, and what the essence or point is of your response. It's a difficult skill to master but this can get you started in the right direction.

4. Slow down your speaking speed

You might be an eloquent speaker when it comes to your mother tongue, but expecting the same standards from yourself when speaking in a foreign language may not be very realistic. Learners are often told not to worry about the mistakes they're making. To overcome this difficulty, you may try slowing down your speaking speed.

Nobody will hold it against you if you speak more slowly and clearly. Great speakers do the same to get their message across. Selecting your words carefully may also be seen as a sign of respect towards your audience. It shows that you want to give them the best possible answer.

5. Give yourself time to think

You may be worried that the people you're talking to are impatient and would like you to say what you want as quickly as possible. First of all, it may not be true – people often prefer a well-thought-out answer to a rushed one.

Learn fixed phrases you can use when remaining silent doesn't seem to be an option. Fixed or set phrases are phrases whose words are usually fixed in a certain order. They can be verb patterns, idioms, collocations – basically anything we always say in one particular way.

For example,

during the day / in the meantime
It's been a long time since…
Sorry to bother / trouble you, but… / Would you mind if…?
Oh, come on!
I'm just kidding!

HOW TO MASTER YOUR GRAMMAR SKILLS

Studying grammar is not easy for any student. It may even be a highly confusing activity that stresses most students out. The use of correct grammar is of great importance for your success in the academic field and future career. It is therefore critical to know some methods of how to improve your grammar skills and learn how to use it properly. Here are some valuable tips that will help you master English grammar. If you follow all the recommendations, you will be able to improve your grammar and writing skills practically in no time and with minimal effort.

17 Tips How to Master Your Grammar Skills

TIP 1 The importance of reading. Reading is probably a number-one method to improve your grammar skills. When reading a book, you strengthen your grammar abilities subconsciously in your mind. It is especially helpful to read aloud as a mixture of different senses like seeing, hearing and saying will help you to reinforce your knowledge on what you have already learnt. It will help you to master fluency in the use of tenses and increase your vocabulary. Reading children's books is a helpful activity in many respects. First and foremost, books for kids are written in simple language and will help you to cover the basics of English grammar and vocabulary.

TIP 2 Pay attention to simple rules. Some students have mastered many complex grammar structures, but fail to use simple ones correctly. This leads to a situation, when students make mistakes in simple sentences even though they might be proficient in many other aspects of English grammar.

TIP 3 Find a grammar manual. It is of much use and importance to have a grammar book at hand as you can consult it from time to time while writing a paper or doing some other tasks. Grammar manuals provide valuable recommendations on how to use various grammar structures correctly.

TIP 4 Review your knowledge of basic rules. Although writing in English and attending classes in linguistics might not be of much interest to many students, it is very important to spend some time reviewing the fundamental rules and principles.

TIP 5 Research information on common grammar mistakes. This will help you to learn how to avoid making grammar mistakes yourself. Learning from others' experience is the best way to avoid making errors in your writing.

TIP 6 Practice a lot. There are many useful resources, both printed versions and online, that will help you to improve your grammar skills. A simple internet search provides access to a great variety of websites where you can study grammar by doing exercises and practicing with the help of games.

TIP 7 Listen to what others say. When your instructors give you feedback on your work, listen to what they say. This will help you to pay attention to the weaknesses in your English grammar knowledge.

TIP 8 Pay attention to details. This is especially important when you write some kind of academic paper. If you are inattentive to details, you will fail to do the work properly as the very meaning of your message to the audience might be distorted due to the incorrect use of grammar.

TIP 9 Proofread what you have read aloud. At times we have to reread some parts of our writing to fill the gaps with required information. It is also important to proofread your paper aloud, because it gives a chance for you to see what mistakes you have made.

TIP 10 Let someone reread your writing for you. This is helpful if you are unable to catch the mistakes in your essay on your own. Reading aloud by someone else will help you to check not only your writing, but also your grammar knowledge.

TIP 11 Learn more about the parts of speech. When studying grammar, it is important to know the basic notions, namely parts of speech. You have to understand how each part of speech functions in the sentence in order to use grammar rules correctly.

TIP 12 Learn about points of view in English. It is important to distinguish the points of view in English language and know the fundamental differences between them.

TIP 13 Learn the word order. Sentences in English are structured in a specific order, which you have to master in the first place. The word order in English is very strict so you have to know the rules of structuring a sentence.

TIP 14 Learn about verb conjunctions. Learn how to inflect the verbs and what tenses correspond to every conjunction. This is an important tip for everyone who wants to learn how to write grammatically correct sentences.

TIP 15 Learn the rules of punctuation. Punctuation in English is quite tricky, so you have to master it to the best of your abilities and know when to use various punctuation marks.

TIP 16 Investigate and analyse various resources. If you want to master grammar, you need to read such resources as textbooks, classic literature, fiction, scientific books, blogs, articles, essays and biographies. You should pay attention to what tenses are used in different cases and how sentences are structured.

TIP 17 Play grammar games. There is a large quantity of online games across the internet. Play various grammar games in your free time. It is not only an enjoyable experience but also a highly useful practice.

HOW TO WRITE AN OUTLINE

An outline is a great way to organize ideas and information for a speech, an essay, a novel, or a study guide based on your class notes. It's a framework for presenting the main and supporting ideas for a particular subject or topic. Outlines help you develop a logical, clear structure for your paper, making it easier to transform your ideas into words and sentences. Once your outline is complete, you'll have a clear picture of how you want your paper to develop.

KINDS OF OUTLINES	
the topic outline	***the sentence outline***

The topic outline consists of short phrases. It is particularly useful when you are dealing with a number of different issues that could be arranged in a variety of ways in your paper.

The sentence outline is done in full sentences. It is normally used when your paper focuses on complex details. The sentence outline is especially useful for this kind of paper because sentences themselves have many of the details in them. A sentence outline also allows you to include those details in the sentences instead of having to create an outline of many short phrases that goes on page after page.

Both topic and sentence outlines follow rigid formats, using Roman and Arabic numerals along with capital and small letters of the alphabet. This helps both you and anyone who reads your outline to follow your organization easily. This is the kind of outline most commonly used for classroom papers and speeches. There is no rule for which type of outline is best. Choose the one that you think works best for your paper.

Tips for writing an outline

At first, writing an outline might seem complicated, but learning how to do it will give you an essential organizational skill! Start by planning your outline and choosing a structure for it. Then, you can organize your ideas into an easy to understand outline.

Planning Your Outline

1. Decide if you will write your outline by hand or type it. If you're preparing your outline just for your own use, choose what works best for you. If you're preparing your outline for an assignment, follow your instructor's directions.

2. Narrow down your topic. Outlines help you organize your thoughts, ideas, or research regarding a topic. Without a main topic, your outline has no purpose. Your topic may be based on an assignment or could stem from a personal goal.

3. Identify the purpose of your outline, such as inform, entertain or reflect. Think about what you hope to accomplish with your outline. Will you complete an essay assignment? Write a novel? Give a speech? Typically, the purpose could be to inform the reader, entertain the reader or share the writer's thinking with the reader.

4. Know your intended audience. If the outline is for university or work, you need to follow the formatting instructions and present your ideas in a way that's understandable to others. For a university assignment, review the assignment sheet or talk to your instructor. If the outline is for work, use an existing outline as a model for yours.

5. Collect your notes, research or supporting materials. In many cases, you'll be incorporating information you gathered through research, note taking, or personal experience. It's important to review this information before you start your outline because you'll be pulling your points and subpoints from it.

6. Develop a thesis or controlling idea for your outline. This will be the thesis you use to complete the final product. Your thesis will help guide your outline as you create sections and subsections organizing your information.

Structuring Your Outline

1. Write an alphanumeric outline for the easy approach. Although you might not recognize the name, most outlines follow the alphanumeric format. Each level of your outline will be organized using a letter or number. For examle:

Roman Numerals - I, II, III, IV, V

Capitalized Letters - A, B, C

Arabic Numerals - 1, 2, 3

Lowercase Letters - a, b, c

2. Make a decimal outline to highlight the relationship between ideas. A decimal outline looks very similar to an alphanumeric outline. However, a decimal outline only uses numbers, and each sublevel is set off with decimals. This allows you to illustrate that each sublevel is a part of a larger argument.

3. Decide if you want to write full sentences or short phrases. Most outlines include short phrases. However, using full sentences can help you better understand your ideas. You might use short phrases to quickly organize your ideas, to outline a speech, or to create an outline that's just for you. You might use full sentences to make it easier to write a final paper, to make a good study guide, or to fulfill the requirements of an assignment.

Organising Your Ideas

1. Group your ideas together. It's okay if you have a lot of information at first. You can always eliminate ideas you understand as unnecessary. Broad ideas are more likely to be your main points, while details are the bits of information you will use to support those ideas. Depending on the purpose of your outline, you may have many subpoints and supporting details. However, it is intended to have at least 2-3 subpoints and 2-3 supporting details for each main idea.

Your broad ideas should connect back to your thesis or controlling idea. If they don't, rewrite your thesis to reflect the main ideas you're putting into your outline.

2. Outline your introduction as the first main point for a speech or essay. You can use either phrases or full sentences, depending on which you choose to use.

3. Create your body headings, if you haven't already. The outline headings are your main points. You'll label these headings with Roman Numerals for an alphanumeric outline (I, II, III) or with Arabic Numerals for a decimal outline (1.0, 2.0, 3.0). If you're writing an essay, this would be the body of your essay. These ideas should be drawn directly from your thesis or controlling idea.

4. Write at least 2 subpoints for each main idea. These are the ideas that further explain your main point. Depending on the purpose of your outline, you might have more subpoints.

5. Add at least 2 supporting details for each subpoint. Supporting details back up or illustrate the point you're making. They might include direct quotes, statistics, facts, or examples. This is the third level of your outline, so you'll use Arabic Numerals for your alphanumeric outline (1, 2, 3). For a decimal outline, you'll go to 2 decimal places (1.1.2). Similar to subpoints, you may have more supporting details, depending on your purpose.

6. Include more layers of your outline, if necessary. Most basic outlines will include 3 layers, but you may need more. If this is the case, you can continue creating sublevels using the formatting structure you chose, either alphanumeric or decimal.

7. Outline your conclusion, if you're writing an essay or speech. Don't expect to write out your final conclusion, as it will be much easier to write it once you've completed the essay or speech. However, it's a good idea to start organizing your thoughts. Your subpoints might include the following:

Restate your thesis.

1-2 summarizing sentences.

Write a concluding statement.

Finalizing Your Outline

1. Read over your outline to make sure you've achieved your purpose. Your outline should relate back to your thesis or main idea, address the purpose you set out to achieve and reflect your audience. If it doesn't, you may need to revise your outline.

Reading over your outline also gives you a chance to look for missing parts or ideas that aren't fully fleshed. If you see areas that leave questions unanswered, it's best to fill in those gaps in information. You might also want to rewrite sentences or phrases to make your ideas clearer.

2. Check for typos, grammatical mistakes, and formatting flaws. It's a good idea to have someone else to check it for errors, as it's often hard to recognize mistakes in your own work.

Although outlining may seem like a long process, it will make the writing process a much easier experience. Once you have your outline completed, all the hard work is done. You're ready to start putting your ideas into full sentences and writing a logical, well-developed essay.

Sample #1

Topic: Asbestos Poisoning

1. Introduction
    - 1.1 Definition of Asbestos Poisoning
    - 1.2 Significance of the Study
    - 1.3 Definition of Terms
2. Body
    - 2.1 Symptoms of Asbestos Poisoning
    - 2.2 Effects of Asbestos Poisoning
    - 2.3 Treatments
3. Conclusion
    - 3.1 Conclusion
    - 3.2 Recommendations
        - 3.2.1 How to Deal with Asbestos Hazards

UNIT IV

PHONETICS

KEEP IN MIND

There are 26 letters in the English alphabet but they stand for at least 44 sounds of real English.

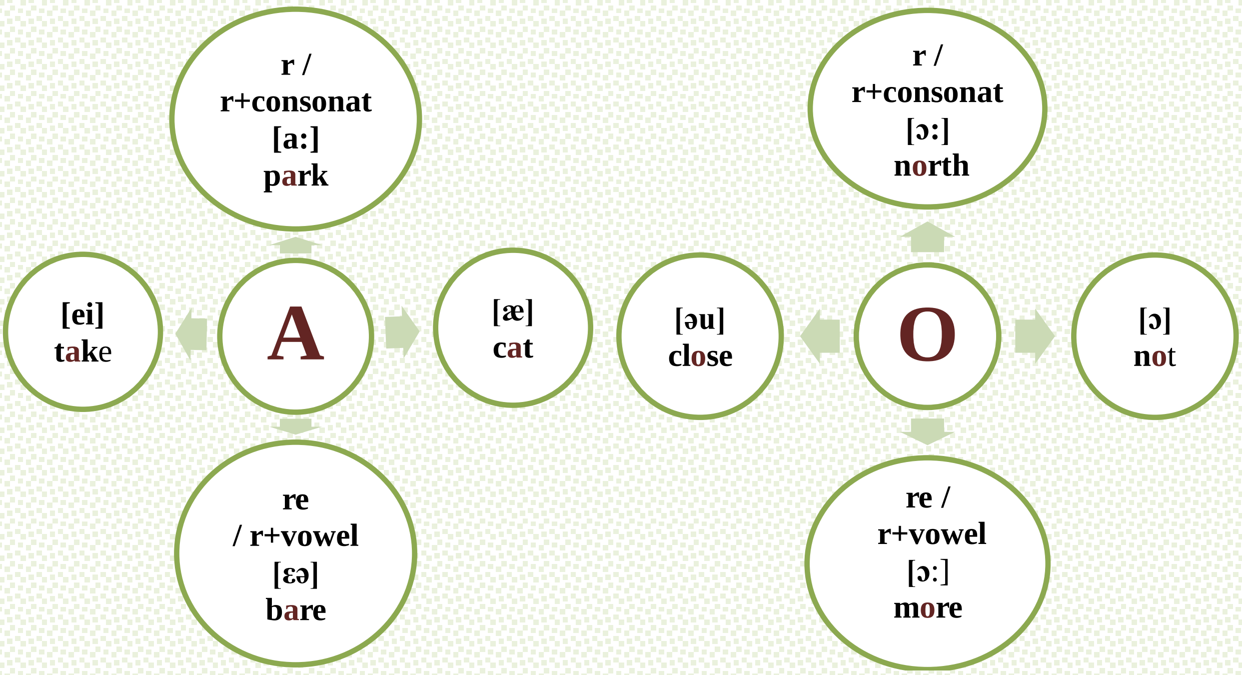
English pronunciation is very different from Russian pronunciation. The number of letters and the sounds that they represent are not the same in English and Russian, and some English sounds do not have corresponding sounds in Russian.

Phonetic transcription is usually written in [square brackets] or between two \backslash symbols\.

Stress: main stress is a short vertical or slant line placed at the top before the stressed syllable in the phonetic transcription of the word; secondary stress is a short vertical or slant line placed at the bottom before the stressed syllable.

E.g.: [prəˌnʌnsɪˈeɪʃən]

English vowels and their letter-sound correlation



r /
r+consonat
[ə:]
purlin

[ju:]
tube

U

[ʌ]
stuff

re /
r+vowel
[juə]
pure

r /
r+consonat
[ə:]
her

[i:]
she

E

[e]
shelf

re /
r+vowel
[iə]
here

r /
r+consonat
[ə:]
girl

[ai]
tie

I

[i]
dig

re /
r+vowel
[aiə]
tire

r /
r+consonat
[ə:]
myrtle

[ai]
type

Y

[i]
symbol

re /
r+vowel
[aiə]
tyre

Reading rules of English vowel digraphs

Vowel monophthongs

sound	letter combinations
[e]	**ea** (often): d**ea**d [ded], pl**ea**sure ['pleʒə]
[i:]	**ee** (always): m**ee**t [m**i:**t
	ea (usually): m**ea**t [m**i:**t], b**ea**m [b**i:**m]
[ɔ]	**a** (after **w)**: w**a**sp [wɔsp], sw**a**n [swɔn]
[ɔ:]	**a** + **u**: f**au**na ['f**ɔ:**nə], t**au**nt [t**ɔ:**nt]; ***but*** **au**nt
	consonant (except for **w**) + **a** + **w**: d**aw**n [d**ɔ:**n], h**aw**k [h**ɔ:**k]
	a + **ll**: t**all** [t**ɔ:**l], sm**all** [sm**ɔ:**l]
	a +**ld** (**lk**): b**ald** [b**ɔ:**ld], t**alk** [t**ɔ:**k]
	a + **r** (rare): w**ar**m [w**ɔ:**m]
	a before **wl, wn:** l**a**wn [l**ɔ:n**], sh**a**wl [ʃɔ:l]
	ou + **r** (not very often): p**our** [p**ɔ:**], m**our**n [m**ɔ:**n]
	o before **r, re:** p**o**rt [pɔ:t], st**o**re [stɔ:]
	oo before **r:** d**oo**r [d ɔ:]
	ou before **gh:** th**ou**ght [θ ɔ:t]
[Λ]	**ou** + **ble**: d**ouble** [dʌbl], tr**ouble** [trʌbl]
	o before **v, n**: gl**ove** [glʌv], d**ove** [dʌv], s**o**n [sʌn]
	BUT: m**o**ve [m**u:**v], fl**oo**d [flʌd], bl**oo**d [blʌd]
[a:]	**a**: l**a**st [l**a:**st], f**a**ther ['f**a:**ðə]
	consonant + **a** before **lm, lf**: p**alm** [p**a:**m], c**alm** [k**a:**m], half [hɑ:f]
	a before **r:** p**a**rt [pɑ:t] **a**rt [ɑ:t]
	a before **sk:** t**a**sk [t **a:**sk]
[u]	**o**+**o**: f**oo**t [f**u**t], t**oo**k [t**u**k]
	after **p**: **pu**t [p**u**t], **pu**sh [p**u**ʃ]
[u:]	b**oo**t [b**u:**t] , m**oo**n [m**u:**n]
	ou + **consonant** (sometimes): c**ou**ld [k**u:**d], w**ou**nd [w**u:**nd]
	r + **u**+ **consonant** + **vowel**: p**ru**ne [pr**u:**n], **ru**mour ['**ru:**mə]
[ɜ:]	**ea** + **r**: p**ear**l [pɜ:l], l**ear**n [l **ɜ**:n]
	in some cases **o** + **r** (after w)**w**: w**or**d [wɜ:d], w**or**k [wɜ:k]
[ə]	**unstressed vowels/vowel combinations**: fam**ou**s ['feiməs], comput**er** [kəm'pju:tə]

Vowel diphthongs

sound	letter combinations
[ei]	**a** + **i**: pa**i**n [p**ei**n], ra**i**l [r**ei**l]
	a + **y** (usually at the end): pr**ay** [pr**ei** , h**ay** [h**ei**]
	e + **y** (usually at the end): gr**ey** [gr**ei**], surv**ey** ['sɜːv**ei**]
	BUT **e** + **y** = [**i:**]: key [k**i:**]
[ai]	**i** + **e** (usually at the end): p**ie** [p**ai**], d**ie** [d**ai**]
	y (usually at the end) m**y** [m**ai**], cr**y** [kr**ai**]
	y + **e** (usually at the end): d**ye** [d**ai**], r**ye** [r**ai**]
[ɔi]	**o** + **i** (in the middle): p**oi**son ['p**ɔi**zən], n**oi**se [n**ɔi**z]
	o + **y** (usually at the end): b**oy** [b**ɔi**], all**oy** ['æl**ɔi**]
[au]	**o** + **w**: h**ow** [h**au**], d**ow**n [d**au**n]
	o + **u**: r**ou**nd [r**au**nd], p**ou**t [p**au**t]
[əu]	**o** + **w** (usually at the end): bl**ow** [bl**əu**], cr**ow** [kr**əu**]
	o + **u** before **l**: s**ou**l [s**əu**l], f**ou**l [f**əu**l]
	o + **a**: c**oa**ch [k**əu**tʃ], t**oa**d [t**əu**d]
	o + **l**: c**ol**d [k**əu**ld], g**ol**d [g**əu**ld]
[iə]	**ear**: h**ear** [h**iə**], n**ear** [n**iə**]
	e re: h**ere** [h**iə**] , s**ere** [s**iə**]
	ee + **r**: d**eer** [d**iə**], p**eer** [p**iə**]
[eə]	**are**: d**are** [d**eə**], fl**are** [fl**eə**]
	air: h**air** [h**eə**], f**air** [f**eə**]
	ear: b**ear** [b**eə**]
[aiə]	**i** + **r** + **e**: f**ire** [f**aiə**], h**ire** [h**aiə**]
	y + **r** + **e**: t**yre** [t**aiə**], p**yre** [p**aiə**]
[aʊə]	**ou** before **r:** h**ou**r [**aʊə**]
	ow before **er, el:** sh**ow**er [ˈʃ**aʊə**], t**ow**el [ˈt**aʊə**l]
[əʊə]	**ow** before **er:** l**ow**er [ˈl**əʊə**]

Consonants

sound	consonant clusters
[ʃ]	**sh**: **sh**eep [ʃi:p], **sh**oot [ʃu:t]
	t before **ion** [ʃ**ən**]: celebra**tion** [ˌsɛlɪˈbreɪ**ʃ**ən], tui**tion** [tju:'iʃn]
	***c*ious** [ʃ**əs**]: deli**cious** [dili'ʃəs], vi**cious** ['viʃəs]
	***c*ian** [ʃ**ən**]: musi**cian** [mju: 'ziʃən], politi**cian** [ˌpɒlɪˈtɪʃən]
[tʃ]	**ch**: **ch**air [**ʧ**eə], **ch**ild [**ʧ**aɪld]
	tch (at the end of the words): ca**tch** [kæʧ], , fe**tch** [fɛʧ]
	t + ure (in an unstressed syllable): crea**ture** ['kri:tʃə], fu**ture** ['fju:tʃə]
[ð]	**th** (between vowels): wi**th**out [wi'**ð**aut]
[θ]	**th** (at the beginning or at the end of a word): **th**anks [**θ**ænks], fai**th** [fei**θ**]
[ŋ]	**vowel**+ **ng**: s**ing** [si**ŋ**], h**un**gry ['hΛ**ŋ**gri], wr**ong** [wro**ŋ**], h**ang** [hæ**ŋ**]
[j]	**u** (open syllable): m**u**te [m**j**u:t], h**u**ge [h**j**u:dʒ]
	ew: f**ew** [f**j**u:], l**ew**d [l**j**u:d]
	y + vowel: **ya**rd [**j**a:d], **yo**ung [**j**Λŋ]
[s]	**s:** **s**ell [**s**ɛl], **s**ea[**s**i:]
	ss (at the end of the words)**:** mi**ss** [mɪ**s**]
	c before **i, e: c**ity[ˈ**s**ɪti], pa**c**e [peɪ**s**]
[k]	**c** before **a, o, u and consonants: c**ame [**k**eɪm], a**c**ute [əˈ**k**ju:t], **c**lean [**k**li:n]
	ck (at the end of a word)**:** si**ck** [sɪ**k**]
[ʤ]	**j** (at the beginning of a word)**:** **j**ury [ˈ**ʤ**ʊəri]
	g before **i, e: g**ist[**ʤ**ɪst], pa**g**e [peɪ**ʤ**]
	dg before **e** 9at the end of a word)**:** ba**dge** **[**bæ**ʤ**]
[r]	**wr** (at the beginning of a word): **wr**ite [**r**aɪt]
	rh (at the beginning of a word): **rh**yme [**r**aɪm]

EXERCISES

1. Click on the button to hear the individual sound associated with that particular symbol, then click on the word to hear the sound as it is used in a common word.

ɑ:	Father
æ	Act
aɪ	Dive
aɪə	Fire
aʊ	Out
aʊə	Flour
ɛ	Bet
eɪ	Paid
ɛə	Bear
g	Get
ɪ	Pretty
i:	See
ɪə	Fear
j	Yes
ɒ	Pot
əʊ	Note

ɔː	Thaw
ɔɪ	Void
ʊ	Pull
uː	Zoo
ʊə	Poor
ə	Potter
ɜː	Fern
ʌ	Cut
ʃ	Ship
ʒ	Treasure
tʃ	Chew
dʒ	Jaw
θ	Thin
ð	These
ŋ	Sing

2. Match the letter or combination of letters in bold with the corresponding sound:

*1) **sh**ip*	a) [dʒ]
2) ma**tch**	b) [ð]
3) ba**ck**	c) [i:]
4) bri**dge**	d) [ɜ:]
5) bo**x**	e) [ʃ]
6) **th**en	f) [ks]
7) **th**ird	g) [k]
8) **qu**ite	h) [θ]
9) na**t**ion	i) [ɔ:]
10) lec**t**ure	*j) [ʃ]*
11) k**i**nd	k) [tʃ]
12) c**a**ll	l) [tʃ]
13) w**ee**k	m) [kw]
14) s**er**ve	n) [aɪ]

3. Pronounce the following words:

[rɪˈpɔ:t], [ˈsʌməri], [ˈsaɪəns], [rɪˈsɜ:ʧ], [ˈbæʧələ], [ɪnˈvɛstɪgeɪt], [ˈpɜ:pəs], [ˈænəlaɪz], [ˈpræktɪkəl], [ˈsʌməri].

4. Listen and tick (√). Listen again and repeat.

a)

	[i:]	**[ɪ]**
six		
read		
three		
slim		
teacher		
singer		

b)

	[a:]	**[æ]**
attic		
garden		
carpet		
plant		
armchair		
flat		

c)

	[θ]	[ð]
this		
three		
bath		
father		
both		
then		

d)

	[ɛ]	[ɜː]
bed		
bird		
herd		
head		
ten		
turn		

e)

	[n]	[ŋ]
wearing		
rain		
making		
shine		
fishing		
run		

f)

	[s]	[ʃ]
shop		
sport		
shoe		
ship		
sun		
street		

g)

	[Λ]	[ɔ]
wrong		
rung		
shut		
shot		

h)

	[ʧ]	[ʤ]
chin		
gin		
Jane		
chain		
cherry		
Jerry		

5. Match the transcription with the correct word.

1. [ˌælfəˈbɛtɪkəl]	a) overview
2. [rɪˈfɜː]	b) technical
3. [ˈhaɪˌlaɪt]	c) arrange
4. [ˈgæðər]	d) highlight
5. [əˈreɪnʤ]	e) gather
6. [ˈəʊvəvjuː]	f) refer
7. [ˌɪntrəˈdʌkʃən]	g) method
8. [ˈmɛθəd]	h) alphabetical
9. [ˈtɛknɪkəl]	i) glossary
10. [ˈglɒsəri]	g) introduction

6. Choose the correct variant.

issue
- 1. [ˈɪʃu:d]
- 2. ['ɪʃu:ɪŋ]ˈ
- 3. [ˈɪʃu:]

analyse
- 1. [ˈænəlaɪzɪŋ]
- 2. [ˈænəlaɪz]
- 3. [əˈnæləsɪs]

conclusion
- 1. [kənˈklu:ʒən]
- 2. [kənˈklu:d]
- 3. [kənˈklu:sɪv]

require
- 1. [rɪˈkwɛst]
- 2.[rɪˈkwaɪə]
- 3. [ˈrɛkwɪzɪt]

briefly
- 1. [ˈbri:f]
- 2. [ˈbri:fɪŋ]
- 3. [ˈbri:fli]

7. Listen to the teacher giving students advice for exams and A) tick (√) the correct alternative to complete the sentences.

1. The teacher wants the students to …

a) take notes after she has finished speaking.	
b) take notes while she is speaking.	
c) forget about taking notes.	

2. The teacher suggests eating …

a) sugary snacks.	
b) only apples.	
c) fruit and cereals.	

3. The teacher suggests finding a study place with a lot of …

a) light.	
b) space.	
c) books.	

4. If students feel stressed they should …

a) go to bed.	
b) go out for a walk.	
c) drink some water.	

5. Students are advised to …
a) select the important things to learn.
b) read through everything once.
c) make notes about every topic.

6. The teacher understands that repeating things can be …
a) difficult.
b) uninteresting.
c) tiring.

7. Students can do past exam papers ...
a) in the library only.
b) at home if they take photocopies.
c) in the after-school study group.

8. The teacher recommends a break of five minutes every …
a) hour.
b) two hours.
c) thirty minutes.

9. It's important to ...
a) eat regularly.
b) sleep when you feel tired.
c)nkeep hydrated.

10. The teacher is sure that the students will …
a) pass their exams.
b) fail their exams.
c) do their best.

B) Put the teacher's advice in the correct column.

DO	?	DON'T

- Get very comfortable.
- Start by choosing the important thing to study.
- Take regular breaks.
- Eat sugary food while studying.
- Try to learn everything.
- Read your notes again and again.
- Focus on details.
- Photocopy past exam papers.

C) Discussion.

Does any of this advice surprise you?

Have you got any good advice to share for studying for exams?

Can this advice be helpful while studying for your candidate examination?

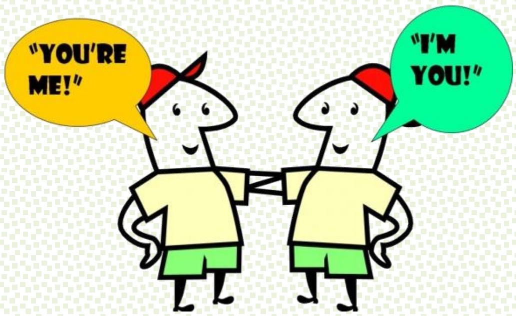
Unit V
GRAMMAR

§ 1
Parts of Speech

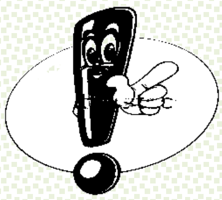
Nouns. Nouns name something. A proper noun names a particular person, place, or thing. A common noun names a general class of things.
Examples
stone, tree, house, George, America, California, committee, herd, navy
Pronouns. Pronouns stand in for nouns. The noun a pronoun represents is called its antecedent.
Examples
I, you, he, she, it, we, they, you, who, which, that, what, this, these, those, such, one, any, each, few, some, anyone, everyone, somebody, each, another.
Verbs.Verbs express actions or a state of being.
Examples
hit, run, walk, meditate, is, are, sing
Adjectives. Adjectives describe nouns or pronouns.
Examples
green, beautiful, fat
Adverbs. Adverbs describe verbs, adjectives, or other adverbs.
Examples
slightly, after
Prepositions. Prepositions link nouns or pronouns to another word in the sentence.
Examples
by, from, for
Conjunctions. Conjunctions join words, phrases, and clauses.
Examples
and, but, or, yet, since, because
Interjections. Interjections interrupt the usual fl ow of the sentence to emphasise feelings.
Examples: oh, ouch, alas

§ 2

Common Errors in Grammar and Punctuation



Before you hand in any piece of writing, use this list to make any necessary corrections. Remember that the grammar checker on your computer may help you, but it can mislead you.



Incomplete sentences

1. Using the -ing for a verb as a complete verb.

✗	Correction:
He being the most capable student in my group.	either change *being* to *is* or use a comma to attach the whole phrase to a complete sentence.

2. Punctuating a dependent clause as though it were a complete sentence.

✗	Correction:
Even if it has a capital letter and a full stop. ✗ Which is why I always carry an umbrella.	Join the whole phrase onto a complete sentence; commas may be needed, depending on which part of the sentence the phrase is attached to.

Lack of agreement

3. Using a plural verb for a singular subject (or vice versa).

x One of the most widespread trends have been increased advertising by tertiary institutions.	Correction: change have to has (one….has, not one……have).
x The College of Education are located on the Hokowhitu site in Palmerston North.	Correction: even though the college is made up of a large number of people, the college itself is singular ("The College of Education is….")

4. Using a pronoun that does not agree in number or gender with the noun to which it refers (its antecedent).

x Each university has to keep within their budget.	Correction: change the pronoun their to its because each university (the antecedent) is singular (as the verb has indicates).

Inconsistency

5. Inconsistent tenses.

x The sun was shining brightly, but the temperature is quite cold.	Correction: put both verbs (was shining and is) in the present or the past tense.

6. Faulty parallels.

x Children enjoy painting, drawing, and to make things.	Correction: change to make to making so that it matches painting and drawing. This mistake is often made in bulleted lists.

Joining sentences incorrectly

7. Running two sentences together (a run-on sentence).

x This is my last assignment I only have to sit the exam now.	Correction: put a semicolon or a full stop after assignment.

8. Joining ("splicing") two complete sentences with only a comma (a comma splice)

x My first essay was not very good, this one is much better.	Correction: either put in a conjunction like but after the comma, or place a semicolon or full stop after good.

9. Using an adverb

(such as consequently, hence, however, meanwhile, moreover, nevertheless, otherwise, or therefore) instead of a conjunction (such as and, although, as because, but, if, unless, until, when, whereas, or while) to join two sentences.

x Some students earn high marks for internal assessment, however they do not always do so well in exams .	Correction: change the comma before however to a semicolon or a full stop.

10. Omitting the comma
when two sentences are joined by a co-ordinating conjunction
(and, but, for, nor, or, so, or yet).

x The academic year used to be only two semesters long but it is increasingly extended to three.	Correction: insert a comma before a co-ordinating conjunction like but when it links two complete sentences (the comma is sometimes omitted in a short sentence).

Inaccurate embedding

11. Omitting the comma after an introductory word or phrase
at the beginning of a sentence.

x However appropriate commas make	Correction: add a comma after However.

meaning clearer.	

12. Omitting one on the commas when a pair of commas is needed.

x At the end of the semester, when the lectures are over students have to sit exams.	Correction: the phrase when the lectures are over needs a comma at each end because it is an embedding and not a part of the main sentence structure.

Adding unnecessary commas

13. Placing a single comma between the subject and the verb of a sentence.

x All the trees that have lost their leaves, will grow new ones in the spring.	Correction: remove the comma between the subject (All the trees that have lost their leaves) and the verb phrase (will grow).

14. Placing a comma before a fi nal dependent clause.

x Punctuation matters, because is helps readers to understand a written text.	Correction: no comma is needed before a fi nal dependent clause (such as one beginning with although, because, if, since, unless, or when) unless there is a strong contrast between the main clause and the dependent clause.

15. Placing a comma before a restrictive clause.

x The Pohutukawa is a New Zealand tree, that flowers at Christmas time.	Correction: the words that fl owers at Christmas time make up a defi ning or restrictive clause, one that limits the meaning of tree. This clause does not present extra information, but is an essential part of the sentence and therefore should not be separated from the rest of the sentence by a comma.

Inappropriate colons and semicolons

16. Using an unnecessary colon.	
x Some of the main reasons for going to university are: to learn about interesting subjects, to meet new people, and to prepare for employment.	Correction: either omit the colon or make sure there is a complete sentence before it, for example by adding the words the following after are.
17. Using a semicolon instead of a colon.	
x These items were on the breakfast menu; cereal, toast, tea, and coffee.	Correction: use a colon, not a semicolon, to introduce the list after menu.

Misplaced or omitted apostrophes

18. Unnecessary apostrophes	
x talk’s, sleep’s, avocado’s, banana’s, serie’s, business’	Correction: present-tense, third person singular verbs ending in/s/ (she talks, he sleeps) do not need apostrophes; plural nouns (avocados, bananas) do not need apostrophes just because they are plural; no noun requires an apostrophe just because it happens to end in /s/ (series; business).
19. Confusing its for it’s and whose for who’s	
x Its for the person who’s birthday is today. Does the dog recognise it’s name?	Correction: its means belonging to it; it’s means it is or it has; whose means belonging to who; who’s means who is or who has.

20. Apostrophes on the wrong side of the /s/.	
x one boy’s toy truck; two boy’s toy trucks.	Correction: to use an apostrophe with a possessive noun or indefi nite pronoun (anyone, everyone, each other, one, others, or someone else), write the name of the possessor (one boy; two boys), add an apostrophe after it (one boy’; two boys’), and add an /a/ after the apostrophe if you pronounce one (one boy’s; two boys’).
21. Question marks with indirect questions.	
x There was a question in everyone’s mind about how stable the bridge was?	Correction: this is a statement not a question, so it should end with a full stop, not a question mark.

Spelling errors

22. Confusion over the plural forms of classical words (such as data, criteria, media, and phenomena)	
x there were no objective criterias for showing that the data was inaccurate.	Correction: the plural of criterion in criteria; the word data is always plural (the data were……..).
23. American spelling	
x color, labor, theatre, center, traveller, fulfi l, defense, encyclopedia, program	Correction: colour, labour, theatre, centre, traveller, fulfi l, defence, encyclopaedia, programme (but computer program).

24. Confusing words that are similar in sound or meaning	
x The main affect of the scandal was that the principle had to resign.	Correction: affect is a verb meaning to infl uence; a principle is a rule or idea. The sentence should read, “The main effect of the scandal was that the principal had to resign”. If necessary, consult a dictionary to be sure you can distinguish between the words in each pair: accept/except; affect/effect; principle/principal; practice/practise; advice/advise; between/among; fewer/less.

A word of advice: make your own list of words that you often misspell or the meaning of which you find confusing.

Tricky Words

Certain word pairs seem to confuse beginner writers and they may choose the wrong word. A list of the most commonly confused pairs follows:

Affect / Effect

Affect as a verb; use it when you mean that one thing influences another thing.
e.g. The wind will affect TV reception.
e.g. Rheumatic fever affected his heart.

Affected as an adjective
e.g. The affected parts of the plant were pruned.
e.g. An “affected” person behaves in a snobbish or artifi cial way.

Effect as a verb; use it when you mean one thing caused something else.
e.g. The storm effected a change to the appearance of the village.
e.g. He effected a political coup by sending in a private army.

Effect is usually used as a noun.
e.g. The yen has an effect on the Kiwi dollar.
e.g. The effects of the earthquake were felt in several countries.

Accept / Except

Accept is always a verb meaning “to take or receive”, “to believe or approve”, “to agree to” or “to take on”.

e.g. He accepts the Treasurer’s job.
e.g. Will you accept this proposal.
e.g. We all accept the principle of freedom of thought.

Except can be a verb, meaning “to leave out” or it can be a preposition meaning “apart from” or “excluding”.

e.g. Citizens older than 50 are excepted from military duties.
e.g. Everyone must pay taxes, except (for) those without any income.

Advice / Advise

Advice is the noun form; check by seeing if you could put “some” in front of the word.

e.g. The bank manager gave me (some) advice about my mortgage.
e.g. I advise you to reconsider.

Practice / Practise

Practice is the noun form and practise is the verb form.

e.g. She has a very successful dental practice.
e.g. You must practise your scales every day; Pianists need such regular practice.

To / Too

To is used as part of the infinitive verb.

e.g. to search and (to) fi nd.

To is also a preposition used to show direction.

e.g. They travelled to Turkey; Please fax it to me.

Too is an adverb meaning “also”, “as well as”.

e.g. Cut up the onions, and the garlic too.

Too can also be used to express an excessive degree.

e.g. The soil is too dry for planting.

Were / We’re / Where

Were is the plural past tense form of the verb *“to be”* and is used with *“we”, “you”* and *“they”.*

e.g. They were involved in an accident; Were you born in Australia?

We’re is the contracted form of “*we are*” and is used informally.

e.g. We’re having a barbecue after work this afternoon.

Where relates to place, point or position. Often, it forms part of a question.

e.g. Where did you buy that book?

It may also form part of a statement.

e.g. Auckland is the place where I grew up. Where they live is a very new part of the town.

Strategies for Improving Spelling

One way to improve your spelling is to analyse where you seem to be going wrong. There are different types of spelling errors. Understanding some of the different types of errors, and the reasons behind them, will help you to identify the types of spelling errors you make. This will help you to avoid them in the future.

Words that get confused because they sound like each other

too // to // two	paw // pour // pore
hear// here	discrete // discreet
feet // feat	licence // license
there // their // they're	practice // practise
through // threw	current// currant
know // no	principle // principal
weather // whether	effect // affect
won // one	dependent // dependant
for // four // fore	accept // except
your // you're	who's // whose

Words that have been put together into one (the correct spellings are on the left in bold)

at least // atleast	in front // infront
such as // suchas	a lot // alot
in spite // inspite	all right // alright

Words which have been split in two

instead	in stead
together	to gether
without	with out
already	all ready
although	all though
altogether	all together

Words where pronunciation gets in the way

favourite	favrit
perhaps	prehaps
miniature	minature
ancillary	ancilliary
would have	would of
sentence	sentance
involve	envolve
imaginary	imaginry
attract	attrac
comparison	conparison
input	imput

Words in which the endings are misspelled

appearance	appearence
available	availiable
attendant	attendent
responsible	responsable
formidable	formidible
defi nitely	defi nately
applies	applys
existence	existance
independence	independance
dispensable	dispensible
absolutely	absolutly

Words with doubled-up letters

beginning	begining
committee	commitee / comittee
getting	geting
written	writen
too	to
innate	inate
accommodated	accomodated
aggression	agression

Words without doubled-up letters

fulfil	fulfill
fulfilment	fullfillment
commitment	committment
always	allways

Problems with 'e' and 'ing'

coming	comeing
taking	takeing
using	useing

More problems with 'e'

department	departement
considering	considereing
excitement	excitment
precisely	precisley
immediately	immediatley
truly	truely
address	addresse
statement	statment
lovely	lovley

Words with a missing sound

created	crated
literature	litrature
interesting	intresting

Words with letters swapped round

friend	freind
their	thier
strength	strentgh
height	hieght

Vowel sounds

retrieve	retreave
speech	speach

Problems with ‘s’ and ‘c’

necessary	nescessary
dissociate	disociate
occasion	ocassion
conscious	concious / consious

Differences between British and American Spelling

Always write your assignment using British spelling, unless you know that your marker accepts American spelling.

The main differences between British and American spelling are as follows:

1. Most words ending in –our in British English are spelt –or in American English.

British	American
colour	color
flavour	flavor
labour	labor

2. Words ending in –re in British English are usually written –er in American English.

British	American
theatre	theater
centre	center
fibre	fiber

3. With verbs which may end in –se or –ize, British spelling often uses –ise, and American always uses –ize.

British	American
specialise	specialize
realise	realize
equalise	equalize

4. Most words spelt –ogue in British English are spelt –og in American English.

British	American
analogue	analog
catalogue	catalog
dialogue	dialog

5. In British English some words double their consonants before -er or -ed and -ing (e.g. those ending in l or p). This is not the case in American English.

British	American
equalling	equaling
kidnapping	kidnaping
traveller	traveler

6. Words derived from Greek and Latin which have ae or oe in the middle, usually have e in American English.

British	American
encyclopaedia	encyclopedia
gynaecologist	gynecologist
anaesthesia	nesthesia

7. Other common words which are spelt differently.

British	American
programme	program
bank cheque	bank check
defence	defense
pretence	pretense
speciality	specialty