

heighten v.	повышать, усиливать
hold v.	придерживаться
imply v.	подразумевать, предполагать
insight n.	понимание, интуиция, проникновение
issue n.	спорный вопрос, проблема
moderator n.	посредник, ведущий в дискуссии, руководитель секции
order n.	порядок
outcome n.	результат
outgrowth n.	результат, следствие
predetermined a.	предопределенный, заранее установленный
pursue v.	преследовать, следовать, выполнять
questionnaire n.	анкета, вопросник
review n.	обзор, рецензия
sophisticated a.	сложный
testify v.	свидетельствовать, подтверждать
thesis n.	диссертация
tight a.	сжатый, плотный
time scale n.	масштаб времени
undertake v.	предпринимать
unscientific a.	антинаучный
updated a.	усовершенствованный
variety n.	разнообразие, разновидность
yield v.	давать в результате

UNIT 2

THE RESEARCH PROCESS

The aims of this unit:

- to make you think about the stages you will need to complete as part of your research process;
- to reflect upon the correlation between the object and the subject, the goal and the objectives of research;
- to analyse the concept of a research hypothesis;
- to practise in formulating basic stages of your research.

FOCUS ON INFORMATION

1. Scan the text about the research process and write the number of the section (1 – 8) where you can find the following information. Do it as quickly as possible.

a. how to prove that your problem is topical

- what are stages of research
- how to describe the goal and set the tasks of your research
- what is a hypothesis
- how to evaluate your research
- how to formulate the hypothesis
- how to draw conclusions
- how to specify the object and the subject of research

1. Most research textbooks represent research as a multi-stage process that you must follow in order to undertake and complete your research project. The precise number of stages varies, but they usually include formulating and clarifying a topic, critically reviewing the literature, choosing a strategy, collecting data, analyzing data and writing up. You may suggest that the research process is rational and straightforward. Unfortunately this is very rarely true, and the reality is considerably messier. While research is often depicted as moving through each of the stages outlined below, one after the other, this is unlikely to be the case. In reality you will probably revisit each stage more than once. Each time you revisit a stage you will need to reflect on the associated issues and refine your ideas.

Research is sometimes described using the hourglass model. The hourglass model starts with a broad spectrum for research, focusing in on the required information through the methodology of the project (like the neck of the hourglass), then expands the research in the form of discussion and results.

The whole process of research can be divided into the following steps:

- setting general area of research
- defining the object of research
- analyzing problem situation and stating a problem
- specifying the subject of research
- formulating a research goal
- setting objectives
- moving a hypothesis
- developing research methods
- collecting, describing, processing, interpreting research data
- drawing conclusions, proving a hypothesis and resolving a research puzzle
- determining application areas
- writing research project

2. Any research starts with setting a research area which is determined by a number of objective and subjective factors. The objective determinants are such as topicality, novelty, urgency of the research. The subjective factors include scientific and professional interests of a researcher, his expertise, aptitudes, frame of mind, etc.

The object of the research is always broader than the subject chosen for research. It is a system of relations and properties of the phenomenon which exists objectively in theory and in practice and serves as a source of relevant information. The subject of the research is more concrete and includes only those relations and properties which are subject to direct investigation. It denotes what the author is planning to create in the process of studies.

A research problem is a puzzle that can't be explained with available knowledge and needs solution.

3. In the introduction to the research paper it is necessary to prove that the chosen problem is topical. A problem is topical if it meets at least three requirements:

- the problem has not been fully studied;
- much or something in the problem remains vague;
- lack of knowledge on the problem makes a loss to community.

To prove that the problem chosen for the research is topical the author gives a review of the previously published papers on the topic and a list of authors who were active in the studies of the problem. Then he/she mentions that though the problem has been given considerable attention, still something is not known and makes concrete what is still unknown on the topic. One also mentions what is still vague and needs elaboration. Then the author describes difficulties that spring up because the problem of his/her research has not been fully studied.

4. There is usually one major goal of research with objectives. The wish of the author to study a problem is expressed usually in one sentence which says that the goal of the research is to study the defined topic. Concrete objectives are further specified. The tasks of the research are usually the following:

- to clarify the nature and structure of the phenomenon being researched;
- to analyze the approaches to the research topic in literature;
- to describe aspects of the research topic by observation;
- to generate a model;
- to carry out an experiment;
- to analyze experimental results;
- to find out the ways of improving efficiency of the phenomenon under research.

The tasks (objectives) of research are set in order to plan the steps of the research. They may correspond to the order of the units and chapters of the research paper as a whole.

5. A hypothesis is a tentative assumption that proposes a possible explanation to some phenomenon or event. A hypothesis is said to be forceful if the assumption is not obvious from the very beginning of the research and really needs to be well proved. Researchers weighing up alternative hypotheses should take into consideration:

- testability;
- simplicity;
- scope – the apparent application of the hypothesis to multiple cases of phenomena;
- fruitfulness – the prospect that a hypothesis may explain further phenomena in the future;
- conservatism – the degree of "fit" with existing recognized knowledge-systems.

Hypotheses can be logical (arising from literature review), descriptive (predicting certain features in a phenomenon) and explanatory (anticipating plausible explanation of a puzzle).

Generally a hypothesis is used to make predictions that can be tested by observing the outcome of an experiment. If the outcome is inconsistent with the hypothesis, then the hypothesis is rejected. However, if the outcome is consistent with the hypothesis, the experiment is said to support the hypothesis.

6. How are hypotheses formulated?

- Bacterial growth may be affected by temperature.
- Ultra violet light may cause skin cancer.
- Temperature may cause leaves to change color.

All of these are examples of hypotheses because they use the tentative word “may”. However, their form is not quite correct. Using the word “may” does not suggest how you would go about proving it. If these statements had not been written carefully, they may not have even been hypotheses at all. For example, if we say “Trees will change color when it gets cold” we are making a prediction. Or if we write “Ultraviolet light causes skin cancer”, we make a conclusion. One way to prevent making such easy mistakes is to formalize the form of the hypothesis.

Formalized hypothesis examples:

If *leaf color change* is related to temperature, **then** *exposing plants to low temperatures will result in changes in leaf color*.

If *skin cancer* is related to ultraviolet light, **then** *people with a high exposure to uv light will have a higher frequency of skin cancer*.

Notice that these statements contain the words, **if** and **then**. They are necessary in a formalized hypothesis.

Formalized hypotheses contain two variables. One is “independent” and the other is “dependent.” The independent variable is the one the scientist controls and the dependent variable is the one the scientist observes and/or measures. In the statements above the dependent variable is printed in italics and the independent variable is underlined. The ultimate value of a formalized hypothesis is that it forces us to think about what results we should look for in an experiment.

7. The conclusions are the results of research findings. Usually the conclusions follow the order:

- conclusion on whether the research goal has been achieved;
- conclusion on whether the hypothesis has been proved or not;
- conclusion on whether each research task has been fulfilled;
- conclusions on what has been found in fulfilling every research task;
- conclusion on additional findings during the research;
- conclusion on further prospects to continue the research.

8. Evaluation of the research paper is done out of 100 %. Each item of evaluation is assessed out of 10 %. In all there are 10 items of evaluation:

- innovative subject;
- forceful hypothesis;
- concrete research goal;
- clear research tasks;
- adequate methods of research;
- detailed presentation of data;
- convincing interpretation;
- well grounded novel conclusions;
- complete bibliography list;
- perfect format.

If your research paper scores less than 65 % it is “non-pass” and will have to be improved. A satisfactory result is up to 80 %. Between 80 % and 95 % is a good grade. An excellent result is 95 % and over.

2. Restore the logical order of the stages of research:

- studying known facts about the object of research
- formulating and clarifying a topic
- defining the object of research
- choosing adequate methods
- moving a hypothesis
- setting objectives
- collecting experimental data
- stating a problem
- explaining the results obtained
- determining application areas
- quantitative and qualitative processing of data

3. Complete the sentences according to the text above.

1. Research as a multi-stage process that ...
2. General research area is determined by ...
3. The object of the research is ...
4. The subject of the research denotes what ...
5. A research problem may be defined as ...
6. A problem is topical if ...
7. A hypothesis is a tentative assumption that ...
8. Hypotheses should meet the requirements of
9. Hypotheses are of three types, namely ...
10. The hypothesis is rejected if
11. Formalized hypotheses include ...
12. The conclusions of research follow the order...
13. If you want to be proud of your research, it should meet the following parameters:
 - _____ subject;
 - _____ hypothesis;
 - _____ research goal;
 - _____ research tasks;

- _____ methods of research;
- _____ presentation of data;
- _____ interpretation;
- _____ novel conclusions;
- _____ bibliography list;
- _____ format.

4. The logic of all experimental researches is basically the same, regardless of the field of study in which the scientist is working. The information presented in the table below is from the field of teaching foreign languages. Match the formulations in column A with basic stages of research in column B.

A	B
1) the model of teaching students to writing expository essays	a) general area of study
2) to elaborate the methodology of teaching writing expository essays and verify its effectiveness experimentally	b) object of research
3) literature review, observation, teaching experiment	c) research problem
A	B
4) teaching English as a foreign language	d) subject of research
5) contradiction between students' need in mastering academic writing and lack of model teaching it	e) research purpose
6) to define the properties and rhetorical organisation of expository essays; to study productive, reproductive and socio-cultural aspects of academic writing; to consider existing approaches to teaching writing	f) research objectives
7) the process of teaching students to academic writing	g) hypothesis
8) teaching students to writing expository essays will be more effective if it is organized by modeling basic characteristics of academic discourse thought of as an activity and as a product	h) methods

FOCUS ON LANGUAGE

5. Find Russian equivalents of the English words used in the text about research process.

1) precise a.	a) настоятельность, крайняя необходимость
2) clarify v.	b) беспорядочный, грязный
3) review v.	c) очищать, рафинировать, усовершенствовать
4) straightforward a.	d) опыт, квалификация, мастерство
5) messy a.	e) связанный, сопутствующий, объединённый
6) depict v.	f) пролить свет на, выяснить, сделать ясным
7) outline v.	g) очертить, обрисовать в общих чертах
8) reflect on v.	h) неясный, неопределённый, нечеткий
9) associated a.	i) описывать, изображать, рисовать
10) tentative a.	j) прямой, простой
11) refine v.	k) обозревать, рецензировать, пересматривать
12) specify v.	l) правдоподобный, приемлемый, вероятный
13) anticipate v.	m) точно определять, устанавливать, уточнять
14) hourglass n.	n) способность, склонность к чему-либо
15) urgency n.	o) разрабатывать, обдумывать, конкретизировать
16) expertise n.	p) подлежащий
17) aptitude n.	q) предвидеть, предугадывать
18) vague a.	r) размышлять, раздумывать
19) elaborate v.	s) предварительный, первоначальный
20) subject to a.	t) точный
21) plausible a.	u) песочные часы

6. Look through paragraph 1 of the text again and find the words which mean the same.

- 1) to explain something in an exact and detailed way
- 2) an idea that attempts to explain something but has not yet been tested or proved to be correct

- 3) not complicated or difficult to understand
- 4) a subject that people discuss or argue about, especially relating to society, politics etc.
- 5) complicated, difficult, and unpleasant to deal with
- 6) based on sensible practical reasons rather than emotions
- 7) to think about something carefully and seriously
- 8) to consider or discuss something again
- 9) to be connected with something in some way
- 10) a glass container that uses sand to measure one hour

7. Complete the sentences with the words above.

1. Darwin offered a working _____ for the mechanism of evolution.
2. There didn't seem to be any _____ explanation for his actions.
3. To make a claim, you must _____ the date when the article was lost.
4. Josie _____ how easily she could have been killed.
5. It's a fairly _____ operation.
6. His social problems were _____ with heavy drinking.
7. I think that's a subject which will have to be _____.
8. It's a website devoted to environmental _____.
9. A symbol of _____ is used in computer programs to show that the program is busy and you should wait.
10. Politics has always been a _____ business.

8. Translate the following sentences into Russian paying attention to the use of the words in bold type.

1. It would take too long to present here even a small number of the arguments which have been propounded both **in favor of and against the hypothesis**.
2. Our experiments were conducted as part of the Joint Global Ocean study, which had **the objective of examining** phytoplankton in the North Atlantic Ocean.
3. Our analysis will be rather informal, but it will **be elaborated in more detail** than has been practicable so far.
4. The new data may not **clarify** variations in the anatomical evolution of different groups of prehistoric populations.
5. The use of biological molecules in such reactions constitutes **a promising approach to** nanophase engineering.
6. Inadequate information allows two types of errors: **accepting a hypothesis as true** when it is false, and rejecting **a hypothesis as false** when it is in fact true.
7. Many of our observations can be objectively **confirmed by** informant tests.
8. The purpose of this book is to **argue in favor of** a fresh paradigm.
9. The book's approach is **consistent with** both its **point of departure** and its aims.
10. Having **laid out** the basic scheme, I should now ideally **specify in grater detail** what goes into each of components which make up my **parsing model**.

9. Analyze the following word combinations and use them to make sentences of your own.

the chief / general the central / key the main / particular the major / primary	aim goal purpose task	of this study research / paper	is to	investigate / establish / compare examine / outline explain / describe propose / specify discuss / demonstrate
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the present	paper / investigation /	focuses on / deals with / is devoted to the problems of / provides insight into / presents a new approach to / proposes a new framework / inquires into / is aimed at / attempts to explain the mechanism of
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advance formulate put forward accept check / test verify contradict reject prove	a hypothesis
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10. Match the words which are very close in their meaning.

- | | |
|---------------------|--------------------------|
| 1) to clarify | a) to attain |
| 2) to reject | b) understanding |
| 3) to verify | c) wording |
| 4) to achieve | d) to explain, elucidate |
| 5) convincing | e) ability |
| 6) insight | f) to research |
| 7) formulation | g) to check, prove |
| 8) to set up | h) to refuse |
| 9) aptitude | i) forceful |
| 10) to inquire into | j) to advance |

PRACTICE ACTIVITIES

11. Read and translate the introduction to the review article on magnetic water treatment. Think of an appropriate heading to each of the three paragraphs of the text.

Magnetic Water Treatment: A critical Review

T. Kudra, Z. Alikhani, G.S.V. Raghavan*

The conventional methods of water purification for direct consumption and industrial use are based on costly and energy intensive technologies such as ion exchange, distillation, membrane separation, and others. Therefore a great attention is given to magnetic treatment which may offer low energy input, simple operation and minimal maintenance. In view of technical and economic advantages of the technology if developed, magnetic processing of water and aqueous salt solutions has been the subject of extensive studies around the world — a large fraction of these studies was carried out by scientists from the former Soviet Union (c.f. the review by Parker et al., 1984).

Despite numerous research papers and technical reports published to date, the possibility of altering water characteristics due to exposure to the magnetic field is still at least a dubious subject. While some researchers claim beneficial effects of magnetic treatment in such areas as desalination, reduction of scale formation, control of bio-growth or simply improvement of organoleptic properties of drinking water, the others neglect these effects at all. Even favorable data that seem to be well documented are often questioned by researchers who have tried to repeat the tests and got completely different results.

Such a fundamental controversy regarding the effectiveness of magnetic water processing and growing importance of water purification call for a renewed verification of the results obtained to date. This paper attempts to review critically the pertinent literature on magnetic water treatment, and to evaluate the possible effects from the magnetic field on dissolved compounds.

12. Find in the text English equivalents of the following Russian word combinations:

a. дорогостоящие технологии	
b. заявлять о благотворном воздействии	
c. магнитная обработка	
d. очистка воды	
e. неясный, сомнительный предмет	
f. опреснение воды	
g. игнорировать влияние	
h. непосредственное употребление	
i. положительные данные	
j. значительное разногласие	
k. повторная проверка	
l. водный раствор	
m. энергоёмкие технологии	

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n. преимущества технологии	
o. технический уход	
p. воздействие магнитным полем	
г. модификация свойств воды	
q. незначительные затраты энергии	
s. относящаяся к делу литература	

13. Analyze the text and define the problem being discussed, the subject and the purpose of the paper.

14. Do you think the author managed to prove that the problem chosen for consideration is topical? Make use of the evaluation form.

Items of evaluation	Yes or No
a. a review of the previously published papers on the topic is given.	
b. a reference to the authors who were active in the studies of the problem is made.	
c. what is still unknown on the topic is indicated.	
d. what is still vague and needs elaboration is stated.	
e. difficulties that spring up because the problem of the research has not been fully studied are shown.	

SELF-CHECK QUESTIONS

1. What stages does the research process include?
2. What factors determine the choice of research area?
3. What is the object of research?
4. What does the subject of research denote?
5. What is meant by a research problem?
6. What problem is considered to be topical?
7. What is a research hypothesis?
8. What requirements should hypotheses meet?
9. What do the three types of hypotheses differ in?
10. When is the hypothesis rejected?
11. What do formalized hypotheses include?
12. What order do the conclusions of research follow?
13. What are items of evaluation of a research project?

GLOSSARY

advance v.	выдвигать, вносить
anticipate v.	предвидеть, предугадывать
apparent a.	вероятный, видимый, очевидный
aptitude n.	способность, склонность к чему-либо
argue in favor of	приводить доводы в пользу
available a.	доступный, имеющийся в наличии
clarify v.	пролить свет на, выяснить, сделать ясным
consistent a.	совместимый, согласующийся, непротиворечивый
contradict v.	противоречить, отрицать
controversy n.	разногласие
convincing a.	убедительный, доказательный
elaborate v.	разрабатывать, обдумывать, конкретизировать
find out v.	выяснить, разузнать, добраться до истины
forceful a.	убедительный, сильный, влиятельный
inquire into v.	исследовать, выяснять, разузнавать
lay out v.	планировать, разбивать, выставлять
messy a.	беспорядочный, безнравственный
neglect v.	отрицать, пренебрегать
point of departure	отправная точка
parsing n.	анализ, грамматический разбор
plausible a.	правдоподобный, приемлемый, вероятный
puzzle n.	вопрос, ставящий в тупик; загадка, проблема
propound v.	предлагать на обсуждение
reflect v.	размышлять, раздумывать
refute v.	опровергать, доказывать ложность
reject v.	отвергать, отклонять
review v.	обозревать, рецензировать, пересматривать
scope n.	область действия, охват, рамки
set v.	устанавливать
specify v.	точно определять, устанавливать, уточнять
spring up v.	возникать, появляться
straightforward a.	прямой, непосредственный, простой