
UNIT 14 GENERALIZATION, CLASSIFICATION, EXEMPLIFICATION

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14.0 OBJECTIVES

This unit will make you aware of: generalization, classification, and exemplification as concepts of scientific writing, and how these are realized in the English language.

14.1 INTRODUCTION

There are different ways of making a generalization. Similarly, for making a classification, there is more than one way. Examples, too, can be given in quite a few ways. Learning these different ways of presenting information will facilitate your learning of science and technology.

14.2 GENERALIZATION

A generalization is a thesis or topic statement of general nature. More often than not, it is a statement which introduces the theme and scope of a concept under discussion. It could also be a statement of fact, observation or hypothesis useful for developing a concept further. Look at the following three sentences:-

1. The remains of plant material (after consumed by animals), and the remains of animals following death are decomposed by microorganisms. These processes of synthesis and decomposition form part of the cycle of life and death. Many of the processes taking place in soil can be considered as components of larger natural cycles.

The first statement introduces the concept of life in the soil. This idea is further developed in the second and third sentences.

In other words, generalizations may be made for:

Introducing a concept/idea, and developing a concept/idea.

Note A paragraph in Scientific writing is defined as a unit that presents information regarding a specific topic. It may contain more than one physical paragraph. For example, you may describe a mechanism or a process in more than one paragraph. As the information is related to one topic, the unit of writing is considered to be, functionally, one paragraph.

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A generalization is, usually, at the beginning of a paragraph. It may also be in the middle or end of a paragraph. Sometimes, it may be in two or three sentences. If the generalization consists of more than one main idea, the writer develops each idea in an individual (physical) paragraph. This unit will make you aware of: generalization, classification, and exemplification as concepts of scientific writing, and how these are realized in the English language

Note: It is useful to remember the differences between a definition and a generalization.

Definition:

A ferromagnetic substance is a substance whose magnetic field increases millions of times when it is placed in a magnetic field.

Or

Ferromagnetic substance are substances whose magnetic fields increase millions of times when they are placed in a magnetic field.

Generalization:

The magnetic field of ferromagnetic substances increases millions of times when they are placed in a magnetic field.

In its physical form, a generalization is different from a classification, although it may serve the purpose of classifying something. Look at the following pairs of sentences. In each of them, the first one is a classification while the second, a generalization.

1. The features of soil may be classified into two groups : physical features, and chemical features.
2. Soil has both physical and chemical features.

Similarly:

1. Materials may be divided into two types: organic, and inorganic.
2. Materials are either organic or inorganic.

14.2.1 Exercise-1

Using the following details, complete the text.

Paramagnetic

Diamagnetic

Attracted into magnetic field

Repelled by magnetic field

Ferromagnetic substances
(more paramagnetic than others)

Eg. Sc³⁺, Zn²⁺, Cd²⁺, Cu⁺

Eg. Elements: Fe, Co, Ni

Alloys: FeCo, FeMn

Compound: FeO₄

TEXT

1. Substances are either -----or-----
2. Paramagnetic substances are -----.
3. Some of them are more ----- than others.
4. These are -----.
5. For example, Fe, Co, and Ni which are -----, and FeCo, and FeMn which are
6. -----substances are repelled by the magnetic field. -----
-----, for example.

Note: These two physical paragraphs hold together in the sense that they together discuss one topic – kinds of substances. Therefore, they may be considered, functionally, a single paragraph.

Explanation

In this text, you will find examples of all the three techniques – generalization, classification, and exemplification. Look at the first statement:

1. Substances are either paramagnetic or diamagnetic.
This is a generalization as the whole text is developed from here. Clearly, it is an implicit classification. You could rephrase it and made it an explicit classification:

Substances may be divided into two groups: paramagnetic and diamagnetic.

The later part of the paragraph gives the criteria of differences.

Now, look at the second and third statements:

2. Paramagnetic substances are attracted into the magnetic field.
3. Some of them are more paramagnetic than others.

Both of them are generalizations at a lower level as they are details which develop the concept further.

Look at sentences 4.

4. These are ferromagnetic substances.

This is a generalization at a still lower level as it builds upon the ideas presented so far. You can, in fact, combine 3 and 4 and rephrase them into a definition:

Ferromagnetic substances are those substances which are more paramagnetic than others.

Or

A ferromagnetic substance is a substance which is more paramagnetic than any other.

To sum up this part of the discussion, *you may present your information in different ways as long as there is coherence in your writing. In other words, the text should hold together as a single unit.*

14.2.2 Exercise-2

Reorder the statements to make a coherent paragraph.

1. First, seeds may augment or deplete local populations, thus affecting population size.
2. Seeds are the main means of dispersal for higher plants and their movement is of interest to the ecologist for two reasons.
3. Secondly, small numbers of dispersing seeds may act as founders of new populations which may grow to significant proportions within a few generalizations.
4. Pollen, which can move much greater distances than seeds, is a significant transporter of genes between established populations but cannot produce either of the ecological results of seed movement.

Questions

There are a few words, in the text, which clearly indicate the sequence of the statements. Fill in the blanks with the words that indicate the position of each statement in relation to the other statements.

In sentence 1, for example, - main means of dispersal, and for two reasons.

Sentence 2 -----

Sentence 3 -----

Sentence 4 -----

14.2.3 Exercise-3

Join the following parts of sentences to make four meaningful statements. Then, reorder them into a paragraph.

1. Bacteria can be grouped later studies showed them to be bacteria.
2. Although early workers considered actinomycetes to be fungi, and those that do not, are termed Gram - negative.
3. This depends upon according to their reaction with Gram's stain.
4. Those organisms which retain the stain are termed Gram-positive. cell wall components.

14.2.4 Exercise-4

Study the following table and complete the text.

Table: Composition of soils

Type of soil	Composition	Capacity to drain water
Sand	70 sand particles 10% clay 10% silt Low content of Mineral salts. Low content of humus.	High
Loam	30%-50% silt, and 5.25% clay. Good content of mineral Salts and humus.	Good
Clay	Mixture of clay, sand and silt. 50% clay particles Rich in mineral salts.	Low

Composition of Soils

Sandy Soil: Unlike clay, which is heavy, sandy soil is light. It contains more or less -----% sand particles and a small proportion of ----- and -----, about -----% of each. This soil is well aerated and water is drained out of it quickly. Therefore, it has a low content of -----, and -----.

Loam: Loam is a mixture of clay and sand. It contains 30-50% of -----, and -----of clay. It has a good content of mineral salts and humus. It can hold water well.

Clay Soil: It is a mixture of -----, sand, and ----- . It contains over -----% of clay particles. This prevents easy drainage of water and clay soil may, therefore, easily become water-logged. Since drainage is poor in -----, it retains dissolved mineral salts and is rich in them.

Note: Read the following two sentences carefully.

1. The clay soil contains over 50% of clay particles.
2. This prevents easy drainage of water.

The first sentence is a generalization and the second sentence is an observation related to it. We can reverse the order of these statements.

1. The clay soil prevents easy drainage of water.
2. This is because clay particles are closely packed leaving little room for air.

Or

It is because the soil contains 50% of clay particles which are closely packed leaving no room for air.

14.2.5 Exercise-5

Fill in the blanks with connectives such as *thus, then, it follows that, it shows that, therefore, and hence* - to connect the following generalizations and the observation.

Example:

Observation: If you put a kilogram of iron and a kilogram of foam in water, iron will sink but foam will float.

**Generalization,
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Generalization: It follows that the densities of these materials are different.

1. Observation: The density of iron is more than that of wood. The density of water is somewhere between these two. This is why lead sinks in water. A piece of wood of the same volume would float on water. So would cork.

Generalizations: 1a-----, materials differ in their density.

1b. Different materials, -----have different densities.

1c. ----- materials differ in their densities.

1d. ----- different materials have different densities.

Note:- We can make the generalization, first. And, then, state the observation. The process would be called deduction. If the generalization follows the observation, the process would be, induction.

14.3 CLASSIFICATION

We classify against three parameters:

1. class/genus/family,
2. class members, and
3. the criteria of differences.

This kind of arrangement makes the similarities/differences between various classes clear. When you classify you answer the question: - Where does this particular species/idea belong?

When you make an explicit classification you use words such as 'classify', 'categorize', 'divide', 'group' etc.

When the classification is implicit the reader infers your purpose through your examples.

14.3.1 Exercise-6

Read the following passage and answer the following questions.

Computers are variously classified as super, mainframe, mini and micro. This classification is based principally on the computer's computing power, i.e a combination of processing capability and speed, the amount of memory available, and to a lesser degree, the number and types of input. Output devices supported.

1. This is a classification as the word ----- clearly indicates.
2. What is the 'class' that is being classified?

3. Who are the 'class members'?

4. What are the criteria of differences?

14.3.2 Exercise-7

Study the figure below and complete the following text.

MEMORY (Class)

RAM	ROM	PROM	EPROM
Information Can be read And written	Information can only be read	Information can only be read.	Information Can be read only
When switched Off, stored information is lost.	Not lost.	Not lost	Not lost.

Memory may be 1. ----- into four types. This classification is made on the basis of 2. ----- criteria. First, whether information 3. ----- be only 4. ----- or 5. ----- and 6. ----- also. Secondly, how power supply affects the stored 7. -----.

14.3.3 Exercise-8

(A) Fill in the blanks using the right form of the words in the brackets.

Matter 1.------(exist) in any of three states: solid, liquid, or gas. Almost all substances on the earth 2.------(occur) naturally in only a single state. The gross characteristics of each of the three states 3.----- (be) quite familiar. Solids (resist) changes in their shape and 4. ----- (do) not flow. While liquids and gases 5.------(be) easily 6.----- (deform). And, they 7.------(flow) too. Hence, they are 8.----- (know) as fluids.

(B) Answer the following questions.

1. Name the class

2. Name the members of the class.

3. List the criteria of differences.

14.4 EXEMPLIFICATION

You may use an example for:

1. developing a generalization,
2. expanding a definition, and
3. explaining a verbal illustration.

Some of the words useful for giving an example are:

For example,
By way of example/illustration, and
as the following example/illustration shows.

'For example' is most widely used. It may be used initially, medially or at the end of a sentence. Notice how it is used in the following sentences.

1. Information on a serial device can only be considered in the same sequence in which it is stored. This would be suitable, For example, for dealing with a mailing list where each address needs to be accessed in turn.
2. More often, we need to access information in a more direct manner than serial devices allow. For example, at any given moment in a bank, some customer will be requesting details about his or her account.
3. Although we talk about an operating system, it is really a collection of separate units which function as a harmonious whole, for example:
 - the language translators
 - the disk operating system,
 - the text editor, and
 - the commands to save, rename, copy, delete, and print.

It is also possible to give examples in the following manner:

Two examples of systems which operate in real time are process control systems and transaction systems.

14.4.1 Exercise-9

Reorder the following sentences to obtain four independent pairs. In each pair: first, identify the sentence which is a generalization. Then, rephrase the second sentence using 'for example' or 'illustrates'.

Note: You may add 'for example' in the beginning/middle/end of the sentence.

1. The nature of humus has been the subject of intense scientific investigation for the past 200 years, but till today its precise chemical composition remains a mystery.
2. Some nematodes, meloidogyns sp, are plant parasites.
3. Plant viruses survive in soil for up to 9 years.
4. A range of plant, insect, and human viruses is found in soil, and they often persist for several years.
5. The distribution of bacteria follows that of the soil organic matter.
6. Table 2.0 ----- the decrease in numbers of bacteria in a soil profile.
7. Only approximately 50% of the organic N in soil has been identified as compounds such as amino acids, amino sugars and nucleic acids.
8. Nematodes can be subdivided into functional groups.

Note:- The verb 'illustrate' is used to refer to the details given in a diagram/figure/table etc. Two other words useful in such contexts are 'show', and 'indicate'.

14.5 LET US SUM UP

This unit has familiarized you with the techniques of generalization, classification, and exemplification for presenting scientific information. For a fuller understanding

of these, you need to study how information is presented in your scientific subjects. Your reading should include not only an understanding of the content but also the way it is structured. For example, while reading about an experiment you may also focus upon how it is presented. This approach will make you aware of useful ways of presenting information.

14.6 ANSWERS TO EXERCISES

14.2.1

1. paramagnetic or diamagnetic
2. attracted into the magnetic field
3. paramagnetic
4. ferromagnetic substances
5. elements
6. alloys
7. compound

14.2.2

Sentence 2 firstly

Sentence 3 secondly

Sentence 4 but, and either of the ecological seed movement

The paragraph may be rewritten as follows:-

Seeds are the **main means of dispersal** for higher plants and their movement is of interest to the ecologist for **two reasons**. **Firstly**, seeds may augment or deplete local populations, thus affecting population size. **Secondly**, small numbers of dispersing seeds may act as founders of new populations which may grow to significant proportions within a few generations. Pollen, which can move much greater distances than seeds, is a significant transporter of genes between established populations **but cannot produce either of the ecological results of seed movement**.

Note Study how the highlighted parts of the sentences help you relate the higher level and lower level generalizations. This is how you need to 'link' your ideas to make the reading smooth.

14.2.3 Rephrasing

 The paragraph may be written as follows:

Notice how the underlined words connect one sentence/idea to the other.

1. Although early workers considered actinomycetes to be fungi, later studies showed them to be bacteria. 2. Bacteria can be grouped according to their reaction with Gram's stain. 3. This depends on cell wall components. 4. The organisms which retain the stain are termed Gram-positive, and those that do not are termed Gram-negative.

Explanation

The first sentence is a generalization and it introduces the subject of the paragraph. The important word/idea, here, is 'bacteria'. And, this is further developed in the second sentence which, in fact, begins with this word. 'The reaction' in the second sentence is replaced with 'this' in the third sentence. The words that connect the fourth sentence to the third are - 'the stain'.

The third sentence is a generalization on a lower level and it develops the idea further. The fourth sentence is a definition.

**Generalization,
Classification
Exemplification**

The first sentence is the introduction to bacteria. The second statement presents how the class of bacteria consists of two kinds of members. This is followed by the description of the criterion of difference.

14.2.5

- 1a. Hence/thus
- 1b. Therefore
- 1c. It shows that
- 1d. It follows that

14.3.1

1. classified
2. computers
3. super, mainframe, mini, and micro
4. computing power,
the amount of memory, and
the number of input/output devices.

14.3.2

1. classified/divided/grouped
2. two
3. can
4. read
5. written
6. information

14.3.3(a)

1. exists
2. occur
3. are
4. do are
5. deformed
6. flow
7. known
8. occupied
9. is spreads

14.3.3.(b)

1. matter
2. solid, liquid, gas
3. resistance to changes in shape, and capacity to flow.

14.4.1

1. 1 and 7

The nature of humus has been the subject of intense scientific investigation for the past 200 years, but still today its precise chemical composition remains a mystery.

For example, only approximately 50% of the organic N in soil has been identified as compounds such as amino acids, amino sugars and nucleic acids.

**Science and Technology :
Writing Skills-1**

2. 4 and 3

A range of plant, insect, and human viruses is found in soil, and they often persist for several years.

Plant viruses, for example, survive in soil for up to 9 years.

3. 5 and 6

The distribution of bacteria follows that of the soil organic matter.

Table 2.0 illustrates the decrease in numbers of bacteria in a soil profile.

4. 8 and 2

Nematodes can be subdivided into functional groups.

Some nematodes, for example, meloidogyns sp. Are