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DEPARTMENT OF BASIC STUDIES

Handout of

Communication And Expression Techniques 2 (English)

Communication and Expression Technique 2

C & E T 2 For Nature and Life Sciences

Intended for Undergraduate Students

Level: 1st year of Bachelor's degree

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Table of contents

Chapter III

Chapter IV

Foreword

Foreword

As you step into the world of higher education, it is easy to look at your upcoming years and think that becoming a biologist is solely about lab work, field data, and exam scores. While those are undeniably vital, there is another parallel skill set that separates a good student from a thriving scientist: the ability to communicate. Science does not happen in a vacuum; a brilliant discovery loses its impact if it cannot be clearly explained, rigorously defended, or shared with the global community. That is exactly why we have designed this module to give you a solid foundation in the core communication and expression techniques you will use throughout your academic journey and your future career. Over the coming chapters, you will systematically build these habits, starting with mastering foundational biological terminology to help you transition into the precise lexicon of professional science. From there, you will learn active reading and note-taking techniques designed to help you efficiently decipher, dissect, and critically evaluate dense scientific literature. Because sharing your findings is just as critical as discovering them, you will also break down the art of presentation, teaching you how to distill complex data into engaging oral presentations and visually compelling scientific posters. Lastly, since modern science is inherently a team work, you will develop the interpersonal skills and group problem-solving strategies necessary to collaborate effectively and navigate complex team dynamics. By the end of this course, you will not just be absorbing scientific facts, you will be actively participating in the scientific conversation, equipped with the tools to evaluate documents with a critical eye, debate ideas with academic rigor, and build the professional relationships that define a successful career in biology. Approach this module with curiosity and an open mind, as the communication habits you build here will serve as the scaffolding for everything you achieve next.

Chapter I

1.Terminology

1. Introduction

Biological terminology encompasses the specialized vocabulary used to describe the vast spectrum of life, ranging from microscopic single-celled bacteria to the intricate structures of plants and animals. This language is the primary tool for scientists, educators, and students to characterize everything from cellular organelles and physiological functions to complex evolutionary lineages and ecological systems. By providing a precise framework for the natural world, it serves as an indispensable foundation for anyone engaged in the life sciences.

A defining characteristic of this field is its heavy reliance on Latin and Greek roots, prefixes, and suffixes, which sets it apart from standard English. Understanding these linguistic origins allows researchers and students to decipher the meanings of unfamiliar terms and communicate with a level of accuracy that common language cannot provide.

Beyond simple identification, the use of standardized terminology is vital for the integrity of scientific research. It ensures that findings are published with minimal ambiguity, allowing for the efficient exchange of data between global laboratories and universities. When scientists use a shared linguistic map to describe new species or cellular processes, they eliminate misunderstandings and foster collaboration. This clarity not only benefits the professional scientific community but also helps students better grasp how living systems function and how different species are evolutionarily connected.

Ultimately, biological terminology is a prerequisite for success in the life science industry. It is more than just a list of words; it is the essential medium through which discovery is documented and shared. For the scientific community to thrive and interact effectively with the public, all participants must engage with and master this specialized language, ensuring that the study of life remains a precise and cohesive endeavour.

1.1. The practitioners of biological language

Biological terminology is the daily bread of a diverse array of professionals, including biologists, ecologists, geneticists, and zoologists. Beyond pure research, it is an essential tool for scientists who must document observations with absolute legal and scientific precision. This linguistic framework also extends to the educational sphere, where science communicators, textbook authors, and educators use it to bridge the gap between complex living systems and

public understanding. For anyone operating within the scientific community, mastering this vocabulary is the only way to ensure transparent communication and a true grasp of biological complexities.

1.2. The scope and application of biological terminology

At its core, biological terminology is a specialized system derived largely from Latin and Greek origins. It provides a concise way for researchers to convey intricate data regarding genetic traits, cellular processes, and ecological relationships. Its application is most critical when describing and classifying life. For instance, a scientist observing a wilting plant would move beyond generalities to use terms like "chlorosis" or a "loss of turgor pressure" to pinpoint the pathology. Similarly, when a new species is discovered, this language allows for a standardized description of its phylogeny, genus, and specific niche within an ecosystem.

1.3. The educational and communicative mechanism

In the classroom and the lecture hall, this terminology serves as the primary mechanism for explaining natural theories. Educators rely on these terms to break down the stages of photosynthesis, such as the light-dependent and light-independent reactions, to show how specific inputs like carbon dioxide and water result in life-sustaining energy. By using correct terminology, the scientific community avoids the pitfalls of "common" language, which is often too vague for high-stakes experimentation. This shared understanding ensures that whether a scientist is establishing a hypothesis or explaining a mechanism to a student, the information remains accurate and consistent.

1.4. Contextual applications

The biological language spans the entire spectrum of life science environments. In laboratory reports and dissertations, it allows for the exact documentation of genetic sequencing and experimental methods.

In field research, it provides the specific labels for animal behaviour and relationships like symbiosis. Furthermore, it provides the backbone for global taxonomy, creating a universal Kingdom-to-Species hierarchy that allows a scientist in one country to know exactly what organism a colleague in another is studying. This precision is equally vital in the pharmaceutical and biotech industries, where describing drug developments and genetic modifications requires a language that leaves no room for error.

1.5. The linguistic architecture of biology

Employing prefixes, roots, and suffixes to produce words with precise meanings is fundamental to developing the biology terminology system. These Latin and Greek-derived word components offer a standardized vocabulary for discussing life, cells, and ecosystems.

1.5.1. Prefixes

Adding a prefix to the beginning of a word can change its meaning. The prefix hypo-, for instance, signifies under or below. The biological term hypotonic is derived from the root word tonos (tension) and refers to a solution with a lower solute concentration than another.

1.5.2. Root Words

The foundation of any biological vocabulary is its root terms, or term origin. They are the essence of the word and supply its primary significance. The root cardi- denotes heart function, for instance. The study of the heart becomes known as cardiology in the biological sciences, specifically zoology and human anatomy.

1.5.3. Suffixes

A suffix is an additional word piece that changes the meaning of a root word. For instance, the -itis ending implies a condition of inflammation. The biological term bronchitis is derived from the root word bronch (airway) and refers to inflammation of the bronchial tubes.

1.5.4. Combining forms

Biologists use combining vowels often -o- to connect word parts, making pronunciation easier.

For example: oste/o (bone) + -logy (study of) forms osteology, the study of bones.

The scientific community can precisely define a vast range of organisms, processes, and structures because of the ingenious use of prefixes, root words, and suffixes in developing new terminology. The ability of biologists to clearly communicate and accurately document the natural world depends on their shared use of a common language.

1.6. Importance of biological terminology

While students occasionally question the relevance of memorizing complex vocabulary, mastering biological terminology is often a transformative asset in a wide range of professional careers. In an era dominated by digital databases, the foundational skills of observing and documenting remain central to the life sciences. Field biologists, for instance, must still be proficient in utilizing paper data sheets, collection logs, and taxonomic keys to record specimen information accurately. Whether on a screen or in a field notebook, the biologist's primary responsibility is to observe, document, and analyse living organisms. This process relies entirely on a standardized vocabulary to ensure that descriptions of physical traits or environmental interactions are universally understood.

The stakes of using this language correctly are remarkably high, as the validity of scientific conclusions hinges on the accuracy of field notes and laboratory records. Incomplete or imprecise terminology can render research data useless or lead to flawed interpretations of an organism's genetic makeup or behavioral patterns. Furthermore, these records serve as more than just academic exercises; they often function as critical evidence in conservation efforts and environmental policy discussions. Ultimately, a firm command of biological language is the essential tool that allows researchers to communicate findings effectively and influence the protection of the natural world.

1.7. Understanding biological terms

While this vast vocabulary can seem daunting at first, its meaning is often easily unlocked by dissecting terms into their constituent parts: prefixes, roots, and suffixes. For example, the term chlorophyll describes the green pigment in plants by combining *chloro* (green) with *phyll* (leaf), just as the study of fungi, mycology, stems from *myc* (fungus) and *ology* (study of).

Understanding the significance of a few key elements can facilitate understanding several biological expressions. The following are tables of several prefixes, roots, and suffixes used in the field of biology.

- **Prefixes:** These appear at the beginning of a word to modify meaning.

Table 01: Most used prefixes with their meaning.

Term	Meaning	Term	Meaning	Term	Meaning
A(n)	absence of	**Dys**	bad, faulty, abnormal	**Para**	beside; related
Ab	away	**Epi**	outer, superficial, upon	**Peri**	around
Ad	to; toward	**Ex**	former; past	**Poly**	many
Amb/ ambi	around; both	**Extra**	outside	**Poly**	much, many
Ante	before	**Hemi**	half	**Post**	after
Anter(i)	front, forward	**Hyper**	excessive, high	**Poster(i)**	back, behind
Anti	against	**Hyper**	over; beyond	**Pre**	before
Aut(o)	self	**In**	not	**Pseud(o)**	false
Auto	self	**Infra**	beneath	**Re**	again
Bi	two	**Inter**	among, between	**Retro**	back; ackwards
Bi, bis	double, twice, two	**Inter**	between	**Semi**	half
Brachy	short	**Intra**	within	**Sol**	alone
Brady	slow	**Less**	without	**Sten(o)**	narrow, compressed
Circum	around	**Mal**	bad, abnormal	**Sub**	under
Co/con	with; together	**Mal**	bad; evil	**Super**	over; greater
Contra	against, counter	**Micro**	small	**Supra**	above
Counter	opposing	**Min**	small	**Syn/sym**	with; together
Di/du	two	**Mis**	wrong	**Tachy**	fast, quick

Dia	across; through	**Mon/mono**	one	**Tele**	far
Dipl(o)	double	**Multi**	many	**Tri**	three
Dis	not	**Non**	not	**Un**	not
Dors	back	**Pan**	all	**Uni**	one

- **Word roots / combining forms**: These contain the core meaning of the word, often referring to a body part, colour, or substance.

Table 02: Most used word roots with their meaning.

Term	Meaning	Term	Meaning	Term	Meaning
Aer(o)	air	**Myc(o)**	fungus	**Oophor(o)**	ovaries
Zoo	animal	**Aden(o)**	gland	**Dem/demo**	people
Hem(ato)	blood	**Ben/bene**	good	**Soci**	people
Cyan(o)	blue	**Therm(o)**	heat	**Tox(i)**	poison
Corpor	body	**Anthrop**	human	**Erythr(o)**	red
Somat(o)	body	**Cent**	hundred	**Spec**	see
Phys	body; nature	**Terr/terra**	land; earth	**Vid/vis**	see
Cyt(o)	cell	**Megal(o)**	large	**Latero**	side
Ped(o)	child	**Mega**	large	**Derm(ato)**	skin
Cycl	circle	**Magn**	large; great	**Crani(o)**	skull
Cry(o)	cold	**Bio**	life	**Phon**	sound
Ankyl(o)	crooked, curved	**Photo**	light	**Gastr(o)**	stomach
Necr(o)	death	**Scope**	look; see	**Ortho**	straight

Mort	death	**Andr(o)**	man	**Glyc(o)**	sweet
Peps, pept	digest	**Mening(o)**	membranes	**Orchi(o)**	testes
Path(o)	disease	**Medi**	middle	**Chrono**	time
Pharmaco	drug	**Lact(o)**	milk	**Hist(o)**	tissue
Xer(o)	dry	**Psych(o)**	mind	**Sens/sent**	to feel
Geo	earth	**Stom**	mouth, opening	**Dent**	tooth
Phag(o)	eat, destroy	**My(o)**	muscle	**Hydr(o)**	water
Oct/octo	eight	**Cervic**	neck	**Aqu**	water
Vac	empty	**Neur(o)**	nerve	**Hydro/hydra**	water
Equ	equal	**Nas(o)**	nose	**Leuk(o)**	white
Lip(o)	fat	**Rhin(o)**	nose	**Graph**	write
Phob(ia)	fear	**Nutri**	nourish	**Script/scrib**	write

- **Suffixes:** These appear at the end of a word to indicate a procedure, condition, or part of speech.

Table 03: Most used suffixes with their meaning.

Term	Meaning	Term	Meaning
able/ible	capable of	**meter**	measure
al	having to do with	**miss/mit**	send
dic/dict	speak; say	**ology**	study of

ence/ance	state; condition	**opsy**	examination
end(o)	inside	**osis**	condition
eu	normal	**ous**	having
gen	become, originate	**penia**	deficient, deficiency
gen	born	**plex**	parts; units
grad	step	**poie**	make, produce
gram, graph	write, record	**port**	carry
hypo	deficient, low	**pos**	put; place
ian	related to; like	**rhag**	break, burst
ic/tic	having to do with	**rhe**	flow
ile	related to	**rupt**	break
intra	inside	**struct**	build
ism	condition; belief in	**tech**	craft; skill
ist	person who does	**therap**	treatment
itis	inflammation	**therm**	heat
ity	state of being	**tion**	action; state of being
lys(is)	dissolve	**ven**	come

1.8. Identification of word parts

Instead of relying on rote memorization, you can decode complex biological terms by breaking them into three core components: roots, prefixes, and suffixes.

- ✓ The root is the fundamental component that defines the core meaning of the term.

  Isolate the base: separate the core from any attached beginnings or endings (e.g., synthes means to put together).

- ✓ Watch for combining vowels: look for extra vowels, usually -o- inserted purely to make pronunciation easier (e.g., cyt- + -o- + -logy = cytology).
- ✓ Prefixes are added to the start of a word to modify its meaning (e.g., photo- means light). Because they don't alter the spelling of the root, they are easy to spot.
- ✓ Active learning strategies: to truly master prefixes, use word trees to link multiple prefixes to one root, create mental imagery (like drawing a cell bursting to remember hyper-), and practice applying them in context while avoiding scientific logic errors.
- ✓ Suffixes are attached to the end of a word to describe a specific process, condition, quality, or classification (e.g., -logy means study of, -osis means condition).
- ✓ Once isolated, combine the meanings of each part to deduce the full definition within a biological.

Table 04: Greek and Latin terms and biological terms with their Arabic translations, meanings, and contextual example sentences.

Greek/Latin Term	Arabic Translation	Meaning	Biological Term	Arabic Translation	Example Sentence
a-, an-	يفتقر إلى	lacking	**A**vascular	لاوعائي	Cartilage is **avascular**, lacking blood vessels.
a-, an-	بدون	without	**A**sexual	لاجنسي	**Asexual** reproduction is a biological process.
a-, an-, hypo-	ناقص / عدم	deficient	**An**emia	فقر دم	**Anemia** is a condition deficient in red blood cells.
a-, an-, in-, non-	غير / لا	not	**Non**-vascular	غير وعائي	Mosses are **non-vascular** plants.
ab-, apo-, de-, ec-, ex-, se-	بعيدا عن	away from	**Ex**crete	إفراز	The kidneys **excrete** waste products away from the blood.
ad-, ob-	إلى / نحو	to, toward	**Ad**renal	قرب الكلى	The **adrenal** glands are located toward the kidneys.
ambi-, amphi-, ampho-, bi-	كلاهما / ثنائي	both	**Bi**sexual	ثنائي الجنس	Some flowers are **bisexual**, containing both male and female parts.
amphi-, ampho-	على كلا الجانبين	on both sides	**Amph**ibian	برمائي	Frogs are **amphibians** living on both land and water.
anti-, contra-, ob-	ضد / مضاد	against	**Anti**body	جسم مضاد	An **antibody** works against antigens to protect the body.
re-, retro-;	عودة / خلف	back	**Re**flex	منعكس	A **reflex** sends a signal back to the spinal cord quickly.
ante-, pre-, pro-	قبل	before	**Pre**natal	قبل الولادة	**Prenatal** development occurs before birth.
ante-, pro-	أمامي / إلى الأمام	forward	**Pro**phase	الطور التمهيدي	**Prophase** is the first forward step in cell division.

anti-	معارض / مضاد	**opposed to**	**Anti**freeze	مضاد تجمد	Some fish produce biological **antifreeze** proteins.
aut-	ذاتي	**self**	**Aut**otroph	ذاتي التغذية	A plant is an **autotroph**, producing its own food.
bi-, di-, dis-	مرتين	**twice**	**Bi**ennial	كل سنتين	A **biennial** plant flowers every two years.
bi-, di-, dis-	اثنان	**two**	**Bi**valve	ثنائي الصمام	A clam is a **bivalve** with two shells.
bi-, di-, dis-, diplo-	مزدوج / ثنائي	**double**	**Di**ploid	ثنائي الصيغة الصبغية	Human somatic cells are **diploid**, containing two sets of chromosomes.
brachy-	قصير	**short**	**Brachy**dactyly	قصر الأصابع	**Brachydactyly** is a condition of abnormally short fingers.
brady-	بطيء	**slow**	**Brady**cardia	بطء القلب	**Bradycardia** is a slower than normal heart rate.
con-	مع	**with**	**Con**genital	خلقي	A **congenital** trait is present from birth.
con-, in-, ob-, per-	شامل / تام	**thorough**	**Per**ennial	معمر	A **perennial** plant lives for several years.
con-, syn-	معا	**together**	**Syn**apse	تشابك عصبي	Neurons communicate across a **synapse**.
contra-	مقابل / عكس	**opposite**	**Contra**lateral	مقابل الجانب	The right brain controls **contralateral** limb movement.
de-	زوال / عدم	**absent**	**De**hydration	الجفاف	**Dehydration** in plants causes wilting due to lack of water.
de-	أسفل / خفض	**down**	**De**compose	تحلل	Fungi help **decompose** dead organic matter.
dextr-	جهة اليمين	**right side**	**Dextr**ose	دكستروز	**Dextrose** is a sugar that rotates light to the right.
dia-, per-, trans-	عبر / من خلال	**through**	**Trans**dermal	عبر الجلد	**Transdermal** patches deliver medicine through the skin.

dia-, trans-	عبر / خلال	**across**	**Dia**lysis	غسيل كلوي	**Dialysis** allows small molecules to diffuse across a membrane.
dis-	بعيدا / إزالة	**away**	**Dis**perse	تشتت	Wind helps seeds **disperse** away from the parent plant.
dolich-	ضيق / طويل	**narrow**	**Dolich**ocephalic	طويل الرأس	A **dolichocephalic** skull is longer and narrower than average.
dys-	صعب / مختل	**difficult**	**Dys**function	خلل وظيفي	Mitochondrial **dysfunction** can lead to low energy.
ec-, ex-	خارج من	**out of**	**Ex**halation	زفير	**Exhalation** moves air out of the lungs.
ecto-	خارج (الكائن)	**outside of**	**Ecto**derm	الأديم الظاهر	The **ectoderm** forms the outer layer of the skin.
en-, endo-, ento-, eso-, intra-	داخل	**within**	**Intra**cellular	داخل الخلايا	**Intracellular** fluid is found within cells.
epi-	على / فوق	**upon**	**Epi**phytes	نباتات هوائية	**Epiphytes** grow upon other plants.
epi-, super-	فوق	**over**	**Epi**dermis	بشرة	The **epidermis** is the outer layer over the dermis.
eso-	داخلي	**inner**	**Eso**phagus	مريء	The **esophagus** moves food from the throat to the stomach.
eso-	إلى الداخل	**inward**	**Eso**tropia	حول داخلي	**Esotropia** is an inward turning of the eye.
eu-	جيد / حقيقي	**good**	**Eu**karyote	حقيقية النوى	A **eukaryote** has a well-defined nucleus.
exo-	خارج	**outside**	**Exo**skeleton	هيكل خارجي	Insects have an **exoskeleton** for protection.

extern-	خارجي	**outer**	**Extern**al	خارجي	Fish have **external** gills for breathing.
extra-	خارجي	**on the outside**	**Extra**cellular	خارج الخلية	The **extracellular** matrix exists outside the cell.
extra-, para-, ultra-	وراء / خارج	**beyond**	**Ultra**sound	فوق الصوت	Bats use **ultrasound** to navigate.
hemi-, semi-	نصف	**half**	**Hemi**sphere	نصف كرة	Each **hemisphere** of the brain controls one side of the body.
homo-, homeo-	متشابه / نفس	**same**	**Homo**therm	ثابت الحرارة	Mammals are **homotherms**, maintaining the same body temperature.
hyper-, poly-	مفرط / كثير	**excessive**	**Hyper**tension	فرط ضغط الدم	**Hypertension** is excessive pressure on artery walls.
hypo-	تحت / ناقص	**below**	**Hypo**dermis	تحت الجلد	The **hypodermis** is the layer of tissue below the dermis.
in-, en-	في / داخل	**in, into**	**In**gest	ابتلاع	Amoebas **ingest** food particles into their cytoplasm.
infra-	أسفل / تحت	**beneath**	**Infra**red	تحت الحمراء	Some snakes detect prey using **infrared** radiation.
inter-	بين / متبادل	**between**	**Inter**cellular	بين الخلايا	**Intercellular** fluid exists between cells.
iso-	متساو	**equal**	**Iso**tonic	متساوي التوتر	An **isotonic** solution has equal solute concentration to a cell.
meta-, post-	بعد	**after**	**Meta**phase	الطور الاستوائي	During **metaphase**, chromosomes align after prophase.

meta-, post-, retro-	خلف / وراء	**behind**	**Post**natal	بعد الولادة	**Postnatal** care is essential for newborn mammals.
micr-	صغير	**small**	**Micr**oscope	مجهر	A **microscope** is used to see small organisms.
mon-, monos-	مفرد	**single**	**Mon**osaccharide	أحادي السكاريد	Glucose is a simple **monosaccharide**.
mono-	واحد / أحادي	**one**	**Mono**cyte	وحيدة الخلية	A **monocyte** is a type of white blood cell.
mult-, multi-	كثير	**much**	**Multi**vitamin	متعدد الفيتامينات	A **multivitamin** contains many vitamins.
mult-, multi-, poly-	متعدد / كثير	**many**	**Multi**cellular	متعدد الخلايا	Humans are **multicellular** organisms.
ne-	جديد	**new**	**Ne**oplasm	ورم جديد	A **neoplasm** is an abnormal new growth of tissue.
olig-	قليل	**few**	**Olig**osaccharide	قليل السكاريد	An **oligosaccharide** contains a few sugar units.
orth-	مستقيم / قويم	**straight**	**Orth**odontics	تقويم الأسنان	**Orthodontics** corrects the alignment of teeth.
re-	مرة أخرى / إعادة	**again**	**Re**generation	التجدد	Some lizards can achieve **regeneration** of their lost tails.
para-	بجانب / مجاور	**alongside**	**Para**site	طفيلي	A **parasite** lives alongside its host and derives nutrients from it.
prot-	أول / بدائي	**first**	**Prot**ozoa	أوليات	**Protozoa** were among the first single-celled organisms.

pseudo-	كاذب / زائف	**false**	**Pseudo**pod	قدم كاذبة	An amoeba extends a **pseudopod** to move.
retro-	رجعي / إلى الخلف	**backward**	**Retro**virus	فيروس قهقري	A **retrovirus** uses RNA to synthesize DNA backward.
sub-	تحت	**under**	**Sub**cutaneous	تحت الجلد	**Subcutaneous** tissue lies under the skin.

1.9. Pronouncing biological words

An individual's ability to pronounce words correctly is crucial for successful communication in the scientific community. Making a mistake in the pronunciation of a biological phrase can lead to confusion, incorrect identification of species, and miscommunication of research findings. If you want to be understood by your peers and professors, you should try to learn how to pronounce biological words correctly. Some tactics for pronouncing biological terms correctly are provided:

- ✓ Deconstruct the word: break terms into prefixes, roots, and suffixes to make them manageable (e.g., mito- + -chondrion).
- ✓ Master stress and emphasis: pay attention to which syllables receive primary or secondary stress to differentiate similar terms (e.g., **photo**synthesis).
- ✓ Enunciate every syllable: speak multi-syllable words fully and clearly to ensure clarity in the lab or classroom.
- ✓ Leverage context: use familiar terms to deduce the pronunciation of related, complex words (e.g., using plasma to help pronounce endoplasmic).
- ✓ Silent letters: e.g., the silent "g" in gnathostome or "p" in pterodactyl.
- ✓ Irregular spellings: vowel combinations like "ae" in caecum or "oe" in coelom that don't match phonetic expectations.

Mastering complex biological terms requires consistent verbal practice. It depends heavily on repetitive vocal practice and auditory exposure. Students can enhance their phonetic accuracy by leveraging multimedia resources, such as scientific audio dictionaries, educational broadcasts, and recorded expert lectures. Ultimately, integrating these terms into daily academic discourse while adhering to standard pronunciation principles fosters both articulatory precision and professional confidence.

Chapter II

2. Text analysis and comprehension

2.1. Introduction to scientific literature

2.1.1. Scientific literature

It refers to written and published works that encompasses research, findings, theories, and discussions. It has four main types :

- Primary literature
- Secondary literature
- Tertiary literature
- Gray literature

a. Primary literature

It refers to original research studies, experiments, and observations that present new findings and contribute novel information to a particular field of study. It is typically published in peer-reviewed journals. It is represented by: original articles, case reports, and technical notes.

b. Secondary literature

It refers to works that analyse, interpret, or review primary sources, providing a synthesis or summary of existing knowledge in a particular field. It is derived from and builds upon primary sources, such as: review articles, books, textbooks, and manuals.

- ✓ **It helps researchers and students** to navigate complex fields of study and understand historical developments.
- ✓ **It provides context** summarizing existing knowledge, and offering critical analyses of primary research.
- ✓ **Gain insights** into the broader implications of scientific work.

c. Tertiary literature

It uses information from primary and secondary literature to provide general overviews, summaries, or introductory content on a particular subject. It is often designed to be accessible to a general audience or individuals looking for introductory knowledge about a topic. It is generally represented by: encyclopaedias, dictionaries, textbooks for beginners, and handbooks, brochures and popular science magazines, and educational Websites.

It is used as a starting point before delving into more detailed primary and secondary sources. It may not provide the depth and critical analysis found in primary and secondary sources. It is valuable for individuals who are new to a field or topic, as it offers a quick and accessible overview.

d. Gray literature

It refers to a category of documents and materials that are produced and disseminated outside academic publishing channels. It is often not peer-reviewed and may not be widely accessible through standard bibliographic databases. It is represented by:

- Theses and dissertations.
- Conference and proceedings.
- Preprints.
- Government reports.
- Non-governmental organization reports.
- Market research reports.
- Technical reports.

This type of literature has a crucial role in research, providing information that might not be obtainable through traditional publishing channels. Scientists often need to actively try to find gray literature through other sources, such as organizational websites, institutional repositories, and specialized databases.

2.1.2. Why we read?

While textbooks, due to their extensive publishing process, may become outdated over the years, academic journals provide a real-time reflection of ongoing research, offering a dynamic and immediate account of current developments in the respective disciplines

Scholarly journals provide comprehensive details that enable readers to replicate experiments. The depth of information allows for the verification of research findings, facilitating the potential replication of experiments with the aim of corroborating results

If you need to know exact results or properties for your own research, articles include actual data, uncertainties, conditions of the experiment, and much more.

Articles provide the authors' explanation of their results and conclusions. You can see their assumptions and determine whether you believe them or not.

2.1.3. The importance of reading scientific articles

Reading scientific articles is crucial for various reasons:

- Dissemination of knowledge by sharing findings and contribute new knowledge to their respective fields.
- Staying informed about the latest developments, and discoveries within their disciplines
- Building a foundation: of a particular subject or field, helping them stay abreast of current research.
- Career development by staying current in the field is crucial for career growth and opportunities
- International collaboration by allowing researchers worldwide to access and contribute to a shared body of knowledge.

Furthermore, it improves personal skills such as: critical thinking and evaluation, teaching and education, identification of gaps, evidence-based decision making, inspiration of new ideas. It is not just a task for researchers but a fundamental practice that benefits individuals, the scientific community, and society as a whole. It is an integral part of the scientific process, promoting the growth of knowledge and the advancement of various disciplines.

2.1.4. Deciding which paper to read

Indicating which papers to read can be a strategic process, especially given the enormous amount of scientific literature accessible. Here are some tips to help you decide which papers to select. Define your purpose, set criteria, use keywords and filters, look for recent publications, and use online tools.

It helps you focus on papers that are directly relevant to your goals. For instance, the publication date, methodology, reputation of the journal or author, and study type narrows down the search results, and also ensure that you are accessing the latest research.

Scientific article selection is an interactive process, and your choices may change as you research deeper into your study. It is crucial to regularly adjust your reading list based on emerging research and the evolving needs of your project.

2.1.5. Structure of a typical scientific article

Scientific article has a structured which enables readers to read and understand the research easily. This structure may vary slightly based on the specific journal's guidelines; however, the main elements remain consistent. Here is the typical structure of a scientific article.

- **Title**: clearly states the topic of the research.
- **Authors and affiliations**: it represents the names of the authors and their affiliations.
- **Abstract**: it is a brief summary of the study.
- **Keywords**: relevant words or phrases to help index the article for search engines.
- **Introduction**: it states the hypothesis, or research question, and explains the importance and objectives of the article.
- **Literature review**: analyses existing literature related to the research topic of afore-mentioned and existing studies.
- **Methods**: defines the study's design of the research, besides, allowing the study to be replicated by other researchers.
- **Results**: presents the data obtained from the study, such as: tables, figures, graphs.
- **Discussion**: demonstrates the interpretation of the results.
- **Conclusion**: recapitulates the key findings and suggests perspectives, or practical applications or implications.
- **References**: according to a specific citation style such as APA, MLA, and Chicago, all the used sources will be cited.
- **Acknowledgments**

2.2. Reading techniques

2.2.1. Skimming techniques

This reading technique involves a quickly glancing over scientific article to get a general idea of its content. It's about identifying headings, subheadings, and any and key words. Look at the first and last paragraphs of each section.

The purpose is to quickly assess the overall theme or subject of the text. To determine if the material is relevant to your needs.

It is important to filter out irrelevant material and saves time. It helps in making decisions about whether to read the entire text or not.

2.2.2. Scanning techniques

Move your eyes rapidly over the text, looking for specific words or phrases. Focus on headings, subheadings, and any emphasized text. Use your hand or a pointer to guide your eyes. Scanning involves looking through a text quickly to locate specific information or details. It is more focused than skimming and targets particular elements.

The purpose is to quickly locate specific pieces of information within a text. It's like searching for keywords or details you already have in mind.

It is important to extract targeted information for fact-checking and quick reference.

2.2.3. Intensive reading

It is a detailed and thorough approach to reading a text. Read slowly and carefully, focus and examine each word and sentence and paragraph. Take notes and annotate the text, then reflect on the meaning of each part.

The purpose is to gain a deep understanding and analyse complex concepts or arguments, and also to extract detailed information

It is important to facilitate in-depth comprehension and supports critical analysis and evaluation of complex academic texts.

2.2.4. Extensive reading techniques

Extensive reading involves reading a large quantity of material quickly. It aims to understand the overall message without focusing on every detail. Read at a faster pace without dwelling on every word. Focus on understanding the main ideas and themes. Cover a significant amount of material in a relatively short time.

It is important to enhances general knowledge and vocabulary. Improves reading speed and comprehension. Develops the ability to grasp the main ideas quickly.

The purpose is to get a broad overview of a topic, to familiarize oneself with a variety of texts, and to develop general language proficiency.

These reading techniques serve different purposes and are often used in combination based on the specific goals and requirements of the reading task at hand. Whether you're quickly reviewing a document, searching for specific details, deeply analysing complex content, or rapidly covering a wide range of material, these techniques can be valuable tools in your reading toolkit.

2.2.5. Importance of developing effective reading habits

Effective reading habits promote the development of critical thinking skills, enabling individuals to assess the validity and reliability of information and make informed judgments. Here is a set of its benefits:

- ✓ Academic success.
- ✓ Efficient learning.
- ✓ Research skills enhancement.
- ✓ Critical thinking development.
- ✓ Stress reduction.
- ✓ Career advancement.
- ✓ Lifelong learning.
- ✓ Cognitive stimulation.
- ✓ Cultural awareness.
- ✓ Better decision-making.
- ✓ Personal growth and reflection.
- ✓ Expanded knowledge base.
- ✓ Enhanced concentration and focus.
- ✓ Language proficiency improvement.
- ✓ Improved writing skills.

2.3. Note-Taking technique

This skill, the art of taking effective notes on scientific texts, is crucial for university students navigating the world of research. Strong notes will help you understand complex concepts, analyse studies critically, and ace your assignments effectively.

The ability to take insightful notes on scientific materials is a critical skill for university students navigating the research environment. Having excellent notes will facilitate your

comprehension of intricate ideas, critical analysis of research, and successful completion of projects.

2.3.1. Importance

Note-taking is not just about passive recording, it is an active learning process. It encourages critical thinking as you decide what is important enough to write down and forces you to engage with the information more deeply. Since the information written down has a significantly higher chance of being recalled compared to information that is simply heard or seen passively.

Scientific texts are full with information, therefore taking effective notes is crucial to grasp the key points and remember them later. Here are some instructions for taking notes when reading a scientific text:

2.3.2. Before reding

It is important to prepare the right equipment. A Scientific dictionary to look up terms you don't know. Besides, your notebook to take notes if you prefer pen and paper, or digital note-taking apps, or annotating the paper itself (if it's a physical copy). So, you'll remember your insights. In addition, discuss what you read with your friends and colleagues, since explaining to others will help you understand the paper yourself.

2.3.2.1. Adopting a Note-Taking mindset

Identify what you want to get out of the text or the paper, knowing your goal will help you focus your note-taking. Then choose a method for taking notes. Here are several note-taking methods personalised for scientific articles:

1. Mind Mapping: make a mental map of the ideas in the article and how they relate to one another.
2. Outlining: for a clear framework, divide the article into major points and supporting points (main points and sub-points).
3. The Cornell Method: you must split your page into sections in order to include significant questions, summaries, and notes.

Adapt these methods to your personal preferences and the nature of your scientific paper. It's often beneficial to combine elements of different note-taking methods for a comprehensive and personalized approach.

2.3.3. While reding

Focus on the structure as scientific papers typically follow a standard format (Introduction, Methods, Results, Discussion, Conclusion). Use this structure to organize your notes. Correspondingly, active reading allows you to engage with the article and also to extract the essence from it. Therefore, do not just passively absorb information. Ask yourself questions about the research, question everything!

2.3.3.1. Taking Notes

Distinguish between key points and details: focus on capturing the main ideas of each section. Don’t get bogged down by every detail. Differentiate your notes by using clear indicators, for direct quotes use quotation marks and page numbers to avoid plagiarism. Paraphrase the content by rephrasing information in your own words. Wrote down your thoughts, personal reflections and areas of confusion. It is also possible to use a mix of techniques, by combining summaries, paraphrases, and direct quotes.

2.3.4. After reding

Review your notes, immediately after reading and fill in any gaps. Take a moment to reflect on the overall idea of the text or the paper and how it fits into your broader understanding of the topic.

Keep the citations in mind: write down the paper’s whole citation using your chosen reference style (APA, MLA, …etc.). When you need to use the document as a reference in your own work later on, this will save you time. Consider using reference management software: tools like Mendeley or Zotero.

These tips will provide you the tools you need to take insightful notes on scientific materials. In addition, they will help you understand and remember scientific texts and papers more efficiently. Keep in mind that solid notes serve as the cornerstone of scholastic achievement.

2.4.Reading texts

2.4.1. Text 1:

Nanoparticles in biology

Nanoparticles, materials with at least one dimension in the size range of 1-100 nanometers, are revolutionizing various fields, including biology and medicine. Their unique size-dependent properties, such as increased surface area, enhanced reactivity, and novel optical and magnetic characteristics, offer unprecedented opportunities in biological research and applications.

One key area of interest lies in drug delivery. Nanoparticles can be engineered to encapsulate therapeutic agents, protecting them from degradation and enabling targeted delivery to specific cells or tissues. This approach holds immense potential for improving the efficacy and reducing the side effects of many medications. For example, nanoparticles can be designed to accumulate in tumors, delivering high concentrations of chemotherapy drugs while minimizing damage to healthy tissues.

Furthermore, nanoparticles play a crucial role in bioimaging. Fluorescent nanoparticles, such as quantum dots, exhibit exceptional brightness and photostability, making them ideal for visualizing cellular processes and tracking biological molecules within living organisms. This technology allows researchers to gain deeper insights into complex biological systems and develop novel diagnostic tools.

In addition to these applications, nanoparticles are being explored for biosensing. Their high surface area-to-volume ratio enables the development of highly sensitive sensors for detecting biomolecules such as proteins, DNA, and even single cells. These sensors have the potential to revolutionize disease diagnosis, environmental monitoring, and food safety.

1. Make a glossary of essential terms for you to know.

Term	*Definition*
Nanoparticles	
Nanometer	
Drug Delivery	
Bioimaging	
Biosensing	
Quantum Dots	

2.Fill in the gaps with the missing words.

Nanoparticles, Biomolecules, Nanometers, Quantum dots, Bioimaging, Biosensors, Drug delivery.

1. **……..…** are incredibly small materials, measuring only a few **…….** in size.
2. One promising application of nanoparticles is in **……**, where they can be used to transport medications directly to diseased cells.
3. **…….** techniques, such as those using **……..**, allow researchers to visualize cellular processes within living organisms.
4. **…….** utilize nanoparticles to detect and measure the presence of specific **…….**

3.Match these words with their definitions.

1. Nanoparticles
2. Nanometer
3. Drug Delivery
4. Bioimaging
5. Biosensing

6. Quantum Dots

a) The process of transporting a therapeutic agent to its target site within the body.

b) Techniques used to visualize biological processes and structures within living organisms.

c) Materials with at least one dimension in the size range of 1-100 nanometers.

d) One billionth of a meter.

e) Semiconductor nanocrystals that exhibit unique optical properties, such as bright fluorescence.

f) The detection and measurement of biological molecules or events.

4.Find the most suitable translation for each of the following word.

1. Nanoparticles
2. Drug Delivery
3. Bioimaging
4. Biosensing
5. Quantum Dots

5.Give Arabic or Franche equivalents to the following English terms

English Term	*Arabic Equivalent*	*Franch Equivalent*
Nanoparticles		
Surface Area		
Reactivity		
Optical		
Magnetic		
Drug Delivery		
Therapeutic Agents		

Degradation	
Targeted Delivery	
Efficacy	
Side Effects	
Chemotherapy	
Tumors	
Bioimaging	
Fluorescent	
Quantum Dots	
Photostability	
Cellular Processes	
Biological Molecules	
Biosensing	
Biomolecules	
Proteins	
DNA	
Disease Diagnosis	
Environmental Monitoring	
Food Safety	

6.Find the synonyms for the following words within the given text.

1. Revolutionizing
2. Unique

3. Encapsulate
4. Efficacy
5. Minimizing
6. Exceptional
7. Sensitive

7.Answer the following questions.

- What are nanoparticles, and what is their typical size range?
- How do the unique properties of nanoparticles make them useful in biology and medicine?
- Describe how nanoparticles can be used for drug delivery.
- Explain the role of nanoparticles in bioimaging.
- How can nanoparticles be used for biosensing?

2.4.2. Text 2:

The critical role of minerals in biological function

When we study the molecules of life, our focus often lands on the organic macromolecules: carbohydrates, lipids, proteins, and nucleic acids. However, the inorganic world, in the form of minerals, plays an equally critical and foundational role in biological structure and function. In biology, a mineral is a chemical element required by an organism as an essential nutrient to perform a range of vital functions. These inorganic elements are obtained from the diet, having been absorbed from the soil by plants and then transferred through the food chain to animals and humans. Their precise balance is crucial for health; for an element to be considered as essential, its deficiency must consistently cause abnormal function that is restored when the mineral is replenished.

Minerals are categorized into two groups based on the quantity the body requires, a distinction that does not reflect their importance, as both are equally vital. Major minerals (macrominerals) are required in amounts greater than 100 mg/day. They are crucial for building structures and regulating fundamental processes. Calcium (Ca) is the most abundant, providing the structural basis for bones and teeth as hydroxyapatite, while also acting as a critical signalling ion for muscle contraction and nerve transmission. Phosphorus (P) partners with Ca in bone and is central to ATP and the backbone of DNA and RNA. Potassium (K), Sodium

(Na), and Chloride (Cl) are the primary electrolytes that maintain osmotic balance and generate the resting membrane potential necessary for all nerve and muscle function. Finally, Magnesium (Mg) is an indispensable cofactor for hundreds of enzymes, especially those involved in energy metabolism and genetic synthesis.

Trace minerals (microminerals) are required in minute amounts (less than 100 mg/day), but they are indispensable assistants to biological chemistry. Iron (Fe) is a central component of heme in haemoglobin, making it vital for transporting oxygen in the blood and storing it in muscle (myoglobin). Iodine (I) is an essential component of the thyroid hormones (T3 and T4), which regulate metabolic rate and growth. Zinc (Zn) acts as a cofactor for a wide array of enzymes involved in DNA synthesis, immune function, and transcription factors. Copper (Cu) is necessary for iron metabolism and connective tissue formation, while Selenium (Se) is a key component of the antioxidant enzyme glutathione peroxidase, protecting cells from free radical damage.

The body meticulously regulates mineral levels through complex homeostatic mechanisms, primarily controlling absorption in the gut and excretion by the kidneys. This delicate balance prevents both deficiency and excess, either of which can have severe consequences. Calcium deficiency can lead to osteoporosis, weakening the bones. Iron deficiency causes anaemia, resulting in fatigue due to reduced oxygen-carrying capacity. Iodine deficiency leads to goiter (enlargement of the thyroid gland) and, in developmental stages, can cause cretinism. Similarly, an imbalance in electrolytes like Na and K can critically disrupt nerve and heart function, potentially leading to dangerous arrhythmias. In summary, minerals are the elemental workhorses of biology; they provide the structural framework, enable electrical signals, and serve as the critical assistants that allow our enzymes to drive the complex chemistry of life.

1. Make a glossary of essential terms for you to know.

Term	*Definition*
Electrolytes	
Essential Element (or Essential Nutrient)	
Homeostatic Mechanisms	
Major Minerals (Macrominerals)	
Osmotic Balance	
Trace Minerals (Microminerals)	

2.Fill in the gaps with the missing words:

Cofactor, electrolytes, goiter, homeostatic, hydroxyapatite, iron, major minerals, minerals, resting membrane potential, trace minerals.

When we study biology, the importance of organic macromolecules is often emphasized. However, 1._____ play an equally critical role as essential nutrients. They are categorized into two groups. 2._____, like calcium and potassium, are required in large amounts, while 3._____, such as iron and zinc, are needed in minute quantities but are just as vital.

Calcium provides the structural basis for bones and teeth as 4._____ and acts as a key signalling ion. Phosphorus is central to ATP and the backbone of nucleic acids. Elements like

sodium and potassium are 5._____ that maintain osmotic balance and generate the 6._____ for nerve function.

Among the trace minerals, 7._____ is central to hemoglobin for oxygen transport. Iodine is a component of thyroid hormones, and a deficiency can lead to 8._____. Zinc acts as a 9._____ for many enzymes. The body regulates these minerals through 10._____ mechanisms, primarily in the gut and kidneys, to prevent both deficiency and toxic excess.

3.Match these words with their definitions.

Term	*Definition*
1. Major Mineral	A. A mineral required in minute amounts, acting as an indispensable assistant to biological chemistry (e.g., Iron, Zinc).
2. Trace Mineral	B. The complex processes by which the body maintains stable mineral levels, primarily through absorption and excretion.
3. Electrolytes	C. A major mineral that is a central component of ATP and the backbone of DNA and RNA.
4. Cofactor	D. A major mineral that provides the structural basis for bones and teeth and acts as a key signalling ion.
5. Homeostatic Mechanisms	E. An inorganic chemical element required by an organism to perform vital functions.
6. Calcium (Ca)	F. Minerals like Potassium and Sodium that maintain osmotic balance and are vital for nerve and muscle function.
7. Phosphorus (P)	G. A mineral required in the diet in amounts greater than 100 mg/day for building structures and regulating processes.

8. Mineral	H. A substance, often a mineral, that is essential for an enzyme's biological activity.

4.Find the most suitable translation for each of the following word.

English Word	*Arabic Translation*
Deficiency	
Consistently	
Replenished	
Hydroxyapatite	
Backbone	
Osmotic balance	
Indispensable	
Meticulously	
Homeostatic	
Delicate	
Osteoporosis	

Goiter	
Cretinism	
arrhythmias	
workhorses	

5. The table below contains words from the text. Find a word or phrase from the text that has a similar meaning (a synonym) for each one and write it in the blank space.

Word from the Text	*Synonym from the Text*
1. critical	
2. obtained	
3. precise	
4. crucial	
5. minute (adjective)	
6. array	
7. regulates	
8. delicate	
9. abnormal	

10. assistant	

6.Answer the following questions.

1. What is the fundamental criterion for a mineral to be considered an "essential element"?
2. What is the key difference between "major minerals" and "trace minerals"? Does this difference reflect their importance to the body?
3. Besides providing structural support in bones, what other critical role does Calcium play in the body?
4. Which mineral is described as an "indispensable cofactor" for enzymes involved in energy metabolism, and which group (major or trace) does it belong to?
5. Name two trace minerals that are directly involved in the function of specific proteins: one in oxygen transport and one as part of an antioxidant enzyme.
6. How does the body primarily maintain the balance of mineral levels to prevent deficiency or excess?
7. What are the two main severe health consequences mentioned for an Iodine deficiency?
8. The text states that an imbalance of electrolytes like Sodium and Potassium can be critically disruptive. What specific bodily functions do these minerals directly affect?

Chapter

III

3.Written and oral expression techniques

3.1. Oral Presentation

3.1.1. Definition

An oral presentation is fundamentally a structured talk that intended to inform, educate, convince, or entertain the listeners. Oral presentations, whether brief or lengthy, can be delivered either individually or as part of a group in various fields by students, professors, or professionals. Whereas the main purpose is to disseminate the new knowledge they produce based on their readings, expertise or research. Presentations are commonly used in academic settings, in class, at conferences or seminar, public lectures, companies or business meetings, and other events.

3.1.2. The importance of oral presentation

Oral presentations allow you to:

- ✓ Analyse information, organize thoughts, and present them in a logical way.
- ✓ Share information and ideas in a clear, concise, and engaging way.
- ✓ Solidify your knowledge and identify areas that might need further clarification.
- ✓ Enhances your communication and public speaking skills and confidence.
- ✓ Convince the audience of a particular viewpoint, encourage them to take action, or gain their support for an idea.

3.1.3. Different types of oral presentation

In the academic field there is different types of oral presentations. However, here are the most common according to the purpose:

1) **Informative presentations**: such as conferences, provide information about a particular subject
2) **Instructive presentations**: are centred on how to do something, typically in a sequential manner. They are frequently used in technical fields for product demonstrations or software tutorials.
3) **Persuasive presentations**: aim to convince the audience to take a specific action or adopt a particular viewpoint.

4) **Motivational speeches**: intended to inspire and motivate the audience, these presentations are often used graduation ceremonies
5) **Decision-making presentations**: Used to provide information pertaining to a decision that needs to be made, often include data and various options.
6) **Progress reports**: show the progress made on a project or initiative. They are common in research environments.
7) **Public lectures**: expert-led presentations for the public, designed to disseminate information or understanding about a specific subject.
8) **Impromptu speeches**: a spontaneous speech that is not planned in advance, it can be difficult but successful with adequate preparation and practice.

Hence, mastering the skill of delivering effective presentations is vital in university and further endeavours.

3.1.4. The elements of oral presentation

Getting ready for a speech requires taking the same steps as getting ready for an essay, but using spoken language and keeping the live audience in mind. Important aspects of oral presentations include planning, structuring, preparing and presenting.

3.1.4.1. Planning

Generally, a good deal of planning is required to avoid mistakes. Therefore, there is three main point that we should focus on:

a. Purpose

Determine the objective of your study. Ensure that you delve deeply into your subject to gain a thorough comprehension of it. This will help you identify the main emphasis of your presentation and the key messages you want to convey verbally. Prepare what will the other group members say. If you are presenting as a group, answers to potential questions by anticipating them in advance. Consequently, answering these questions help to identify the purpose:

- What is the objective of the presentation?
- What is the main focus of the presentation?
- Why are you presenting it in oral form?
- what will the other group members say, if you are presenting as a group?

b. Audience

The presentation audience refers to the individuals to whom you are conveying your information. The particular audience will change based on the presentation's context. Knowing your audience is essential in creating a successful presentation. This is the reason:

- ✓ To modify the degree of difficulty, utilize suitable terms, and select examples that are related to their interests.
- ✓ To employ particular strategies to capture their focus and maintain their engagement depending on their size and background.
- ✓ To adjust the speed, level of formality, and inclusion of humour to match the audience's expectations.

Accordingly, responding these queries help to recognise the audience:

- To whom will you be presenting this content?
- What do your listeners hope to achieve by listening to you?
- What are the ages and educational background of your listeners?
- Do they have a greater or lesser level of knowledge on the subject compared to you?

Taking into account your audience helps in creating a presentation that connects with them and achieves your intended result.

c. Setting

During a presentation, the setting refers to the physical environment where you deliver your speech. It includes different elements that can affect how the presentation is experienced by both you and the audience. Below is an overview of several important elements of the environment:

- **Physical space**
  a. Size: room size needs to comfortably fit the number of attendees.
  b. Layout: arrangement and design of the room can impact audience engagement.
  c. Stage or platform: A raised platform can improve visibility.
  d. Lighting: adequate lighting prevents the audience from having to strain their eyes.
- **Devices and tools**
  a) Projector and screen: necessary for effectively showcasing the presentation.
  b) Microphone: to make sure everyone hears your voice.
  c) Internet connection: If your presentation includes online components or tools.

A comfortable and well-equipped environment can enhance your self-assurance and help you deliver a more polished presentation, which can impact audience involvement and overall

interaction. Getting familiar with the setting in advance and making sure everything is well-prepared, can reduce the chances of problems and give an effective presentation. Therefore, replying these requests is crucial:

- What facilities will be available?
- Is there a computer with a projector?
- How big is the room?
- Will you need a microphone?
- Can you visit the room beforehand to check the facilities?
- Will your audience be seated in rows or around tables?

3.1.4.2. Structuring

A well-structured presentation provides a clear framework, logical flow, and a foundation for a strong impact. A typical structure for an oral presentation, as with any effective essay, needs an introduction, a body and a conclusion.

a. The Introduction

It is crucial to have an introduction. It enables you to captivate your audience and establish the context for the upcoming discussion. Lacking an introduction, your audience will be unaware of your direction and main points. A proper introduction must contain:

- ✓ Your name (and potentially your educational background)
- ✓ The subject of your presentation
- ✓ A short introduction to the subject
- ✓ A justification for the significance of the subject
- ✓ A plan of the key points
- ✓ Any inquiries that you will tackle
- ✓ Is there anything specific you would like the audience to think about or ask during your presentation?

The purpose of the introduction is to guide the audience by previewing the key points and their sequence in your talk. Do not linger on the introduction for too long, yet allow your audience enough time to understand your message.

b. The Body

The main portion of the presentation is the body. In this section you may expand on your ideas, using visuals or audio. Only incorporate elements that enhance the clarity and impact of

your point. Do not forget to provide illustrations for each point, and utilize charts or tables as needed. Make sure to include specific instances to support each argument.

c. The Conclusion

Ensure that your conclusion aligns with the main points discussed in your introduction and body, without exceeding the length of the introduction. It needs to give the audience a lasting impression of the subject. You need to think about the following inquiries:

- ✓ What were the key highlights you discussed?
- ✓ Were any questions answered by you during the presentation?
- ✓ Did you inquire the audience about any questions that you now need to go over?
- ✓ Are there any uncertainties that the audience has?
- ✓ What is the main takeaway you hope your audience retains from your presentation?

d. Question Time

Some presentations may not allow for a question-and-answer session. Nevertheless, make sure you are well-prepared for your presentation so you can respond to inquiries related to your topic. If you are faced with questions you can't answer, do not hesitate to admit, 'I don't know, but I'll look into it'. You can also consider inquiring with other attendees if they are aware of the solution.

3.1.4.3. Preparing

Being prepared will boost your confidence. But, the majority of individuals experience anxiety prior to giving a presentation. Here are a few factors to take into account:

a. Time limit

Ensure you adhere to the specified time constraint. If you drag on, you are stealing time from others and your listeners will grow tired and impatient. Simultaneously, avoid wrapping up too soon, as it could give the impression that you lack understanding of the subject or did not conduct thorough research. Thus, you should:

- ✓ Determine the anticipated duration of your speech.
- ✓ Practice your presentation multiple times to enhance it, making sure to record the duration of each run-through.

- ✓ Ensure that you are able to contain the information within the allotted time frame, without hurrying through the delivery.
- ✓ Ask for questions or invite discussion but be clear about the amount of time allocated.

b. Voice projection

Voice projection is not limited to simply shouting. It's important to use your voice in a way that allows all audience members to hear you clearly and without strain. Here are a few important factors to take into account:

- ✓ Speak clearly and loudly enough to reach the back row.
- ✓ Use a microphone if your voice is soft.
- ✓ Speak at a pace that allows your listeners to understand you easily.
- ✓ Avoid speaking in a monotone, instead change the pitch of your voice.
- ✓ Speak confidently. Confidence grows with thorough preparation and effective rehearsals.
- ✓ Check the correct pronunciation of new or foreign words, technical words and names.
- ✓ Use pauses and stress to emphasise your main points.

c. Body language

Your audience can receive messages from your body through impressions. This is why it is recommended to:

- ✓ Maintain strong eye contact with your audience so they not only hear but also see you.
- ✓ Observe all individuals, not only a select few in the first row. so that everyone feels that you are talking to them.
- ✓ Maintaining proper posture can convey that you are competent and articulate while speaking.
- ✓ Show enthusiasm, if your topic excites you, your audience will also be enthused.
- ✓ Use appropriate gestures with your hands (avoid gesturing too much though)
- ✓ Avoid distracting mannerisms or habits e.g., using “okay” to start most sentences.

d. Notes / Cue Cards

Reading from a text can cause a decrease in eye contact, intonation, and posture. Condense your original text into bullet points and practice recalling the information during your

rehearsals. Utilize written reminders, whether on cards or a piece of paper. Label the cards in case they are accidentally dropped.

e. Practice

Make sure you don't just present your speech once, but multiple times to improve. Practice with a critical companion in the same setting where you will present the talk. Think about capturing the practice session on video so you can review it multiple times and identify areas that need improvement.

f. Anxiety and nerves

Despite appearing nervous, keep in mind that your audience is typically interested in your topic and will likely be supportive of your presentation. Even thought, if you are experiencing high levels of anxiety, consider:

- ✓ practicing deep breathing and speaking slowly before beginning.
- ✓ behave as if you are self-assured and smile. you will likely appear calmer.
- ✓ keep a glass of water nearby in case your throat gets dry and you need to take a sip.

In addition, with careful planning and practice, your presentation is likely to flow smoothly.

3.1.4.4. Presenting

It is your time to chine, so:

- o Don't read from a script but be prepared enough not to have to!
- o Do enjoy yourself, a bit of humour or a personal story is always welcomed.
- o Do not apologise for the topic, the lack of knowledge, or your English.
- o Make short, simple, and specific statements.
- o When something is important, say it slowly and loudly, and pause occasionally.
- o Never be afraid to stop speaking for a moment.
- o Prepare some additional slides to illustrate the answer to some expected questions.
- o Always stay courteous and professional.
- o Take pointers from people you admire but always be yourself.
- o Thank the audience for their attention at the end of your talk.

a. After the presentation: feedback

Receiving feedback and taking note are crucial steps after giving a presentation. Two primary inquiries can be posed:

- What do you think was good about this presentation?
- What do you think could be improved on?

Any additional inquiries or reflections you want to mention are also acceptable, but remember to first concentrate on the strengths of your presentation. This will assist in reducing any negative emotions you may have had and will help in feeling more confident for upcoming presentations.

3.1.4.5. Components of an effective presentation

Keep in mind this points:

- ✓ Interesting
- ✓ Speaker is prepared
- ✓ Simple, clear, and easy to understand
- ✓ Visual aids are easy to read and understand
- ✓ Speaker talks to audience
- ✓ Ends before or on time
- ✓ No excuses

3.2. Poster presentation

3.2.1. Definition

A scientific poster is a tool for visually communicating research findings concisely and engagingly. It merges aspects of an oral presentation and a written document. They are the most common way that postdocs, graduate students, and undergraduate students share their unpublished or recently published research.

3.2.2. Importance of poster presentation

Various skills could be learnt through this process in the academic field as:

- o New data available for new progress and discoveries.
- o Demonstrate expertise, extensive questions and discussion.
- o Get enough time to discuss more complex studies.

- Deepens understanding of a topic, make revisions several times for final approval.
- Demonstrate attention to details, and gain valuable feedback from the audience.

Furthermore, it opens doors for student and researcher on several opportunities, for instance they could:

- ✓ Represent the laboratory and your sponsor's research.
- ✓ Create collaborations and making more personal exchange.
- ✓ Practice public speaking and communicate the basic points in an informal manner.
- ✓ Share ideas, presenters can interact with those interested in their work.
- ✓ Clients and researchers have the opportunity to meet and discuss.

3.2.3. Posters environment

Presenting posters can be a useful resource in various unexpected situations, you may come across them in this table:

Table 05: Presenting posters in academic field, work and life.

Academic field	Work and life
Conferences	Industry trade shows or conventions
Research symposiums	Internal company meetings
Science fairs	Public events
Class presentations	Community health fairs
Professional settings	Informational days

3.2.4. The advantages of posters

a. They can be examined at leisure or quickly scanned.
b. They provide direct interaction with interested viewers.
c. They can be viewed as a whole entity.
d. They provide more information than a speech.
e. It is a great way for visual illustrations.

3.2.5. The limitations of posters

a. The audience must be drawn in to the presentation as they are not captive.
b. The viewer is not sitting comfortably.
c. Due to limited space, the poster must be selective.
d. Text and visuals should be at a size that is easily visible from a distance of 1m.
e. Preparing posters requires more time and more money compared to creating slides.

3.2.6. Essential elements of a poster

g. Preparing a poster

Poster elements resemble to those found in the scientific articles with some differences. Headings for instance should be clear in bold and short, besides to the Logos (university, laboratory) which are usually placed on either side of the title. The latter keep it short, and use the largest font size. Then, put the authors names, affiliations and also contact details. The main body contain a short abstract with the main objective, in addition, it should follow IMRD structure, whereas the conclusions must answer the questions asked at the introduction. Concerning the references, just cite those related to your work.

h. Design and organization

To create an informative and attractive poster, it is useful to attend a variety of scientific events and meetings to organise ideas. prepare the poster early, a month is sufficient time for revisions to be made. To be organised check visual elements (images, fonts, colour), clarity and conciseness of text, and use white space for readability. However, several tools could be used to design posters like PowerPoints. Here are some useful tips that you may follow:

- Pick a concept.
- Information should be minimal.
- The colour system should have effective contrasting backgrounds.
- The flow should be logical.
- Follow a longitudinal algorithm.
- Adhere to the instructions provided by the congress.
- Ask colleagues for feedback.

i. Presenting a poster

Prepare yourself for the presentation by practicing your explanation and answering, in advance, common questions. Do not hesitate to use eye contact and body language while presenting. Besides, be enthusiastic and use a concise language to engage the audience in discussion. Regarding the questions, do not be afraid, just Lisen actively and ask clarifications if needed.

CHAPTER

IV

4.Group expression and communication

4.1. Definition

Group communication refers to interaction among a limited number of people working toward a shared objective, often focused on solving a common problem. Fundamentally, it is a process of creating shared meaning, uniting diverse individuals and ideas to achieve collective goals. A group is distinguished from a simple gathering of people by four essential characteristics: a shared purpose, interdependence, interaction, and mutual influence.

Groups form around actual or perceived common goals. Members are interdependent, relying on each other to accomplish tasks. Sustained interaction through communication maintains the group's structure. Finally, each member's behaviours and ideas exert influence on the others within the group.

Unlike simple one-way models of message transmission, group communication necessarily flows in multiple directions. This complexity creates unforeseen and interwoven consequences, as members function simultaneously as senders and receivers who must coordinate their personal qualities of experience and competence. Because group communication is a constructive activity, the group's very identity is formed through the talk and interaction among its members.

Group communication is viewed as a social construction of reality rather than just a transfer of information. For effective communication to occur, the group must move beyond "monologue" which consists of impersonal messages to "dialogue," where members speak authentically and listen to understand the experiences of their teammates. This involves a feedback loop where members build their own messages based on the cues and meanings they receive from others.

While all teams are groups, a functioning team requires more than just talk; it necessitates the effective use of both verbal and nonverbal communication links. In a teamwork environment, communication is the central axis around which the group operates, and success depends on achieving quality in both the interpersonal relationships among members and the requirements of the task itself.

The way group communication is defined and practiced often reflects cultural orientations. In individualistic cultures, communication may be more direct and task-oriented,

whereas collectivistic cultures often prioritize group cohesion, harmony, and maintaining relationships over individual goals. Within these structures, group communication serves as a primary tool for socialization, teaching members the values, norms, and required behaviours to participate effectively.

4.2. Effective group communication

Effective group communication serves as the foundation of professional and personal achievement, fulfilling several critical functions that transform individuals into cohesive teams. Its importance can be understood through the core purposes it serves:

First, it is a problem-solving engine, harnessing diverse perspectives to generate creative solutions to complex challenges. Through the process of creating shared meaning, it turns a collection of individuals into a unified, functioning team.

Second, it meets essential human and organizational needs. It provides individual fulfilment by addressing needs for belonging, respect, and esteem within a team. Structurally, it drives organizational productivity by enhancing efficiency and reducing waste. It also enables vital knowledge management, allowing the exchange of tacit, experience-based learning within a community of practice.

Third, it performs key pragmatic and cultural roles. In high-risk fields, it is a critical safety mechanism for error prevention. It is also the primary tool for managing organizational change and alleviating uncertainty. Furthermore, a group's very culture and identity are formed and sustained through ongoing communication.

Ultimately, group communication acts as the central axis of a team, ensuring tasks are accomplished while maintaining healthy interpersonal relationships. By enabling synergy, where the collective outcome surpasses what individuals could achieve alone, it is fundamental to shared success.

We may say that working in groups offers significant advantages that extend far beyond simply sharing a workload. Embracing collaborative learning shapes both academic performance and essential life skills in the following key ways:

- ✓ Academic necessity: many assignments are group-based, meaning individual grades often depend on the collective performance.

- ✓ Skill development: it provides a platform to learn collaboration, negotiation, and conflict resolution.
- ✓ Future career: teamwork is a staple of the professional world; mastering these dynamics early prepares individuals for career success.
- ✓ Learning opportunity: groups expose members to diverse perspectives and different ways of thinking.

4.3. Benefits of effective communication

Effective communication serves as a powerful instrument that molds lives, turns everyday events into victories, and acts as the key to opening doors of opportunity. It is a uniquely human characteristic present in all areas of conduct, from personal identity formation to academia relations. The benefits of mastering this skill can be categorized into organizational, professional, personal, and safety-related domains.

4.3.1. Organizational synergy and efficiency

Building on the group dynamics previously discussed, effective communication is the foundational catalyst for team synergy, allowing a collective group to achieve results far greater than any individual could manage alone. By prioritizing clear information exchange, organizations unlock improved operational efficiency, reducing wasted resources and ensuring employees or students perform at their best. Furthermore, precise communication yields significant cost and time savings by preventing the financial errors and confusion driven by poorly written instructions. Ultimately, it serves as the ultimate cornerstone for collaborative problem-solving and acts as a powerful tool for managing organizational change, equipping leaders to alleviate anxiety and smoothly navigate workplace transitions.

4.3.2. Professional advancement and reputation

In the professional world, communication is viewed as a required competency and a form of competitive fellowship. Mastering this skill acts as a powerful catalyst for rapid career growth, positioning individuals at the forefront of new advancement opportunities. Because clear communication is widely seen as a reflection of good thinking, an individual's professional reputation and credibility rest heavily on their ability to speak and write effectively. Ultimately, strong communication is the bedrock of leadership development, empowering aspiring leaders

to articulate a compelling vision, inspire their teams, and influence others toward achieving shared objectives.

4.3.3. Personal well-being and identity

Building on Maslow's hierarchy of needs, skilful communication is a vital catalyst for fulfilling our highest-level psychological demands. Engaging in meaningful, effective interaction directly satisfies our foundational desire to belong, which reinforces social connectivity and builds personal self-worth. Furthermore, cultivating the higher emotional intelligence skills required to communicate well while regulating emotions provides a psychological buffer against stress and burnout, actively improving physical and mental health. Ultimately, this constructive dialogue and proactive feedback loop accelerate personal development by sharpening an individual's self-awareness, adaptability, and recognition of their unique strengths.

4.3.4. Safety and risk mitigation

In high-stakes industries like agrifood, bioengineering, pharma-industry, and health sector, effective communication is an absolute prerequisite for safety and survival. Implementing standardized communication protocols, drastically reduces operational errors and communication failures, which are heavily linked to preventable patient harm and critical industry mishaps. Furthermore, clear and transparent information provides the essential roadmap that empowers both patients and the general public to make well-informed, safe decisions. Eventually, cultivating communicative mindfulness within high-reliability organizations ensures that teams can collectively anticipate risk and react to crises in a timely manner, successfully preventing catastrophic events.

4.3.5. Advancement of knowledge

Far more than a tool for sharing data, effective communication serves as the fundamental lifeblood of the global scientific community. Prioritizing how we express and exchange ideas expands our collective intellect and builds civilization through several critical mechanisms.

4.4. The group life cycle or Tuckman's model

Tuckman's Model (1965), often referred to as a phasic model, describes the sequential stages that groups typically experience as they evolve from a collection of individuals into a functioning team. The model is characterized by four primary stages: forming, storming,

norming, performing, and adjourning, which correspond to the development of group identity, the resolution of conflict, and the emergence of consensus.

a) **Forming or orientation:** in this initial phase, group members often struggle with understanding who they are as a group and what their specific task consists of. The primary characteristic of this stage is ambiguity, as members search tentatively for ideas and directions.

b) **Storming or conflict:** this is a necessary phase where emotions often run high. Members may compete and argue over ideas, and different coalitions may begin to form within the group.

c) **Norming or decision emergence:** as the group moves past initial conflicts, they begin to establish consensus. During this stage, groups develop shared norms of behaviour and rules of procedure. In virtual teams, this might specifically involve operationalizing expectations, such as how frequently members should check and respond to emails.

d) **Performing or reinforcement:** in the final phase, the group reaches a sense of unity. They achieve consensus on decisions and reinforce the rightness of those decisions by providing supporting evidence for their choices.

e) **Adjourning or morning:** communication focuses on summarizing accomplishments, acknowledging contributions, celebrating success, and planning future steps.

4.4.1. Key characteristics of the model

The model is defined by several dynamic characteristics, most notably its non-linear progression; although presented sequentially, long-term groups frequently repeat phases or loop back to the forming stage when fresh members join. Furthermore, these stages operate on highly variable timelines, meaning the entire four-phase cycle can unfold across an entire academic semester or accelerate into a single meeting when a team faces an urgent crisis.

Crucially, the development of norms is highly malleable during this journey, as targeted interventions or training during the conflict-heavy storming phase can steer groups toward healthier habits and alleviate destructive friction. Ultimately, the model highlights a direct relationship to performance, demonstrating that for a group to evolve into a highly functioning team, it must actively wrestle through these interpersonal differences and harness conflict as a tool to reach the performing stage.

When working in a new group, recognize that the storming phase is not a sign of failure; rather, it is a more colourful and necessary part of the process required to reach a stable, productive agreement. Proactively setting norms early can help your group transition more smoothly into the performing stage.

4.5. Essential skills

Essential skills in technical and professional communication comprise a blend of technical competencies such as scientific writing and data analysis and soft skills including active listening, empathy, and emotional intelligence that enable professionals to translate knowledge into actionable results. Mastery of these skills is considered a requirement for professional competence, as a scientist's or practitioner's reputation often rests on their ability to communicate their findings effectively to diverse audiences. These essential skills are categorized these into several key domains:

Table 06: Essential skills in technical and professional communication.

Domain	Core skill component	Key definition and application
Written and oral Communication	▪ Scientific writing ▪ Editing ▪ Audience targeting ▪ Oral delivery	- Drafts and refines clear, evidence-based documents. - Customizes message to match audience needs. - Uses effective vocal mechanics in presentations.
Interpersonal and soft skills	▪ Active listening ▪ The soler model ▪ Emotional intelligence ▪ Assertiveness and empathy	- Listens closely and confirms understanding. - Signals attention using relaxed, open body language. - Manages emotions and states needs with "I" statements.

Critical thinking and research	▪ Scientific literacy ▪ Information seeking ▪ Quantitative literacy	- Questions and evaluates source methodology. - Efficiently navigates professional literature databases. - Uses data-driven logic and interprets statistics.
Teamwork and leadership	▪ Collaboration ▪ Project management ▪ running meetings	- Works across diverse groups and shares credit. - Sets schedules, roles, and project milestones. - Organizes agendas and guides groups to consensus.
Visual literacy and design	▪ Information graphics ▪ Visual-spatial intelligence	- Designs charts to make raw data digestible. - Uses visual formats to solve problems creatively.
Evidence-based practice	▪ Question formulation ▪ Evidence retrieval ▪ Critical appraisal ▪ Integration	- Asks precise questions and searches for data. - Checks validity and blends findings with expertise.

We may say that there are five skills which are highlighted for each student as essential for group success, establishing clear goals and roles, active listening, giving and receiving constructive feedback, managing conflict constructively, and effective decision-making.

4.6. Common challenges and solutions

Communication challenges range from individual psychological hurdles to complex organizational and scientific barriers. Success in overcoming these requires a transition from one-way information delivery to collaborative dialogue and empathy-driven interaction.

Navigating collaborative work requires actively addressing predictable barriers to team productivity, such as free-riding, dominating behaviours, groupthink, and conflict avoidance. To neutralize free-riders who shirk responsibility, teams should establish transparent roles and deadlines early on, utilize shared tracking documents with visible edit histories, and implement peer evaluations.

When dominating members disrupt progress by talking excessively or interrupting, introducing a facilitator to enforce round-robin speaking techniques and set rigid time limits ensures every voice is heard. Furthermore, teams can dismantle groupthink, where the pressure for harmony suffocates critical evaluation, by appointing a devil's advocate, protecting leader preferences until late in the discussion, and gathering anonymous or external feedback.

Finally, to overcome conflict avoidance, groups must actively cultivate an environment that reframes respectful disagreement as a healthy mechanism for testing ideas rather than a personal attack, utilizing judgment-free brainstorming sessions to keep creative solutions flowing.

4.7. Becoming a better group communicator

To become a better group communicator, you must shift your perspective from a "monologue" mindset to one of dialogue, where the goal is the joint creation of shared meanings to resolve common problems. This evolution requires balancing the technical requirements of a task with the emotional and social needs of the group members.

Here is a guide to mastering these dynamics, drawn from the provided research.

4.7.1. Attending skills

Effective communication begins with your physical presence. Research suggests that people want more than just your physical attendance; they require your psychological and social-emotional presence. You can signal this through the SOLER model :

- ✓ **S:** face the person squarely to communicate that you are with them.
- ✓ **O:** adopt an open posture, uncrossed arms and legs, to signal you are non-defensive and interested.
- ✓ **L:** lean forward at times to show you are paying close attention.
- ✓ **E:** maintain eye contact to build rapport, though you should remain mindful of cultural variations.

- ✓ **R:** try to relax so you do not inadvertently transfer your own anxiety to the group.

4.7.2. Active and reflective listening

Listening is described as the heart of good communication. It is a skill that must be developed through conscious effort and the removal of distractions, such as turning off smartphones during meetings.

- ✓ Listen for total meaning: pay attention to both the factual content and the underlying feelings being expressed.
- ✓ Use paraphrasing: repeat back what you think the speaker means in your own words. This practice significantly increases your social attractiveness and likeability in the eyes of your teammates.
- ✓ Empathic responses: use a curious, non-judgmental tone and avoid the urge to immediately offer advice or moralizing evaluations.

4.7.3. Practice assertiveness, not aggression

Becoming a better group communicator involves stating your feelings and needs clearly without causing offense or being pushy.

- ✓ "I" expressions: frame your views using "I" statements (e.g., I feel frustrated when deadlines are not met) rather than accusatory "you" statements.
- ✓ Clear objectives: assertive communicators allow others to know exactly where they stand, which reduces group anxiety and facilitates collaboration.
- ✓ Responsibility: take ownership of your impact on others and apologize when your actions cause harm.

4.7.4. Navigate the group life cycle

Understanding that groups evolve through a phasic model allows you to adapt your communication to the group's current needs:

- ✓ Storming phase: recognize that conflict is a necessary and healthy part of group development. Use this stage to test ideas rather than attacking individuals.
- ✓ Norming phase: focus on establishing shared rules and expectations, such as how frequently to check emails or how to vote on decisions.

- ✓ Performing phase: aim for synergy, where the group's collective output becomes more than the sum of its individual parts.

4.7.5. Adapt to digital and intercultural contexts

Modern group work often takes place across digital platforms or diverse cultural boundaries.

- ✓ Digital etiquette or netiquette: online communication lacks many non-verbal cues, so your signals must be precise and unambiguous. Avoid zoom fatigue by taking breaks and using various communication methods.
- ✓ Cultural sensitivity: modifying your communication style to fit the preferences of others (e.g., adjusting your degree of formality or directness) is essential for establishing foreign relationships and diverse teams.
- ✓ Empathy strategies: when working with international peers, use an empathy strategy to understand what might be preventing them from participating (e.g., power imbalances or language barriers) and provide more wait-time for responses.

Conclusion

Ultimately, the journey of a scientist is as much about sharing knowledge as it is about discovering it. As you turn the final pages of this handout and complete this module, remember that communication is not a static skill, but a dynamic, lifelong practice that will evolve alongside your research. Carry these communication and expression techniques forward with confidence into your future laboratories, field research, and academic endeavours. The foundations have been laid now it is up to you to use your voice to shape the future of biology.

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