EGE 313 - GENERAL EDUCATION ELECTIVE 3

COLLEGE OF TEACHER EDUCATION AND TECHNOLOGY

University of Southeastern Philippines,
Tagum Mabini

EGE 313
GENERAL EDUCATION ELECTIVE 3

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Welcome Message

Greetings Future Educators! Welcome to EGE 313 – General Education Elective 3 Course pack! This module will allow you to explore our natural world and discover how every aspect of it influence and interact with each other. Here you will learn how to think like an environmental scientist, develop an appreciation of your own impact on the environment, and discover just a bit more of what makes this world of ours beautiful. So shift those brains to maximum gear and get those snacks within reach! It's time for science!

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For administrative concerns (College Dean - Contact details)
For UVE concerns (KMD - Contact details)
For health and wellness concerns (UAGC, HSD and OSAS - Contact details)

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UNIVERSITY OF SOUTHEASTERN PHILIPPINES

VISION

Premier Research University in the ASEAN.

MISSION

USeP shall produce world-class graduates and relevant research and extension through quality education and sustainable resource management.

GOALS

At the end of the plan period, the University of Southeastern Philippines (USeP) aims to achieve five comprehensive and primary goals:

1. Recognized ASEAN Research University
2. ASEAN Competitive Graduates and Professionals
3. Vibrant Research Community
4. Proactive Research-based Economic Empowering Extension Services
5. Capacity for Innovative Resource Generation

INSTITUTIONAL GRADUATE ATTRIBUTES

LEADERSHIP SKILLS

Creates and inspires positive changes in the organization; exercises responsibility with integrity and accountability in the practice of one's profession or vocation.

CRITICAL AND ANALYTICAL THINKING SKILLS

Demonstrates creativity, innovativeness, and intellectual curiosity in optimizing available resources to develop new knowledge, methods, processes, systems, and value-added technologies.

SERVICE ORIENTED

Demonstrates concern for others, practices professional ethics, honesty, and exemplifies socio-cultural, environmental concern, and sustainability.

LIFELONG LEARNING

Demonstrates enthusiasm and passion for continuous personal and professional development.

PROFESSIONAL COMPETENCE

Demonstrates proficiency and flexibility in the area of specialization and in conveying information in accordance with global standards.

CORE VALUES OF THE UNIVERSITY

UNITY
STEWARDSHIP
EXCELLENCE
PROFESSIONALISM

THE COURSE OVERVIEW

COURSE TITLE : EGE 313 – General Education Elective 3 (Environmental Science)

CREDIT : 3 Units

SEMESTER : Second

TIME FRAME : 12 Weeks

COURSE DESCRIPTION : This course deals with the interrelationships among the components of the natural world, environmental problems, their causes, associated risks, preventive measures and alternative solutions.

COURSE OUTCOMES :

	Course Outcomes	Graduate Outcomes Aligned to
CO1	Develop understanding on the interdisciplinary nature of the environment.	IGA1, 2, and 3
CO2	Communicate environmental information and idea logically and concisely in a variety of forms.	
CO3	Develop the ability to identify environmental research questions and formulate hypothesis or guiding statements	

COURSE ASSESSMENT:

Learning Evidences and Measurement Rubrics (reflected in the syllabus)

	Learning Evidence	Descriptions and other Details	Course Outcomes it Represents
LE1	Reflective Journal	This task requires you to reflect on your own personal understanding on current environmental issues and its associated risks.	CO1
LE2	Case Analysis	This task requires you to analyze a case/environmental issue, identify causes and risks and provide alternative solutions including analysis of the implementation of environmental policies/regulations.	CO3
LE3	Advocacy Campaign	This task will require you to create a poster and a slogan or a 2-minute video depicting your personal campaign to provide awareness on environmental problems and develop accountability and environmental responsibility.	CO2

Measurement System:

LE1: REFLECTION PAPER

Area to Assess	Beyond Expectation	Expected	Acceptable	Unacceptable
Accuracy (Grasp of readings	21 – 25 Paper represents the authors' ideas, evidence or conclusions accurately, fairly and eloquently. Shows a firm understanding of the implications of each author's argument(s)	16 – 20 Paper represents the author's ideas, evidence and conclusions accurately	11 – 15 Paper represents the author's ideas, evidence and conclusions accurately but not sufficiently clear. Minor inaccuracies.	6 – 10 Paper misrepresents the authors' ideas, evidence and/or conclusions. Major inaccuracies. Or does not distinguish between major ideas and less relevant points.
Argument (depth of analysis)	26 - 30 Paper fully meets requirements. Explores implications of social science theories and pillars of education. Makes convincing case for why selected ideas connect (or contradict) two texts, and/or two texts, and/or connect (contradict) texts and lectures Consistently precise and unambiguous wording, clear and lucid sentence structure. All quotations are well chosen, effectively framed in the text and explicated where necessary	21 – 25 Paper full meets the requirements but does no exceed them. Makes good case for why selected key ideas connect(or contradict) two texts, and/or connect (contradict) texts and lectures Mostly precise and unambiguous wording, mostly clear sentence structure Mostly effective choice of quotation. Mostly effective framing and explication of quotation where necessary	16 – 20 Paper does not address some aspects of the assignment. Makes somewhat convincing case for why selected ideas connect (contradict) two texts, and /or connect (contradict) texts and lectures. Imprecise or ambiguous. Confusing sentence structure Poorly chosen quotations or ineffective framing and explication o quotations	11 - '15 Paper does not address the assignment Select minor rather than key ideas, and/or does not show why the selected ideas connect (or contradict) texts, and/or connect (contradict) texts and lectures. Consistently imprecise or ambiguous wording. Confusing sentence structure Quotations contradict or confuse student's text. Quotations used to replace student's writing.
Presentation	16 – 20 Paper is clean, correctly formatted(11-point font Arial, double space, normal margins) written in full sentences. Quotations are all properly attributed and cited in a consistent style. Virtually no spelling or grammatical errors.	11 - 15 Paper is clean, correctly formatted(11-point font Arial, double space, normal margins) written in full sentences. Quotations are all properly attributed and cited in a consistent style. A few minor spelling or grammatical errors	6 – 10 Paper is clean, correctly formatted (11-point font, Arial, double space, normal margins), written in full sentences. Some improperly attributed quotations and/or inconsistent citation style. A number of spelling or grammatical errors.	1 – 5 Paper is sloppy or incorrectly formatted, not written in full sentences. Many improperly attributed quotations or inconsistent style of citation. Many spelling or grammatical error.

Equivalent Score $= \left(\frac{raw\ score}{total\ no.of\ items}\right) x\ 50 + 50$

$= \left(\frac{raw\ score}{50}\right) x\ 50 + 50$

$= \left(\frac{}{50}\right) x\ 50 + 50$

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LE2: CASE ANALYSIS

Area to Assess	Beyond Expectation	Expected	Acceptable	Unacceptable
Knowledge / Understanding	16 – 20 Knowledge of issue is exceptionally accurate and is explain clearly and effectively during explanation using details and little reliance on notes	11 – 15 Issue is accurately explained and uses many details and various sources n presentation with reliance on notes	6 – 10 Issue is explained with some accuracy but need more details and more variety in sources and less reliance on notes	1 – 5 Issue needs to use more accurate information and details or examples Heavy reliance on notes during presentation
Thinking / Inquiry	16 – 20 Exceptional critical comments and analysis of issue / interpretations / impact /effect / using details, insight, evidence from essay and comprehensive thought	11 – 15 Proficient critical comments and analysis of issue / interpretations and impact using many details and evidence and some insight	6 – 10 Some critical comments given to issue and effects More details, insight and critical thought needed	1 – 5 Lack of critical or analytical thought n comments and little to no insight used
Communication	16 – 20 Exceptional delivery and timing of information Exceptional discussion initiated and maintain to further student learning	11 – 15 Proficient delivery and timing of information Proficient discussion started and maintained	6 – 10 Delivery and timing of information needs to more smooth (too much reading) More active interaction and discussion	1 – 5 Poor delivery and timing of information Discussion needs to be more controlled and dynamic
Application	16 – 20 Discussion questions are exceptionally insightful Presenters make critical conclusions and connections in feedbacks and answering questions Powerpoint is exceptionally detailed, organized, logical and includes images, clear and large font	11 – 15 Discussion questions are insightful Presenters make clear conclusions and connections in feedbacks and answering questions Powerpoint is detailed, organized, logical and includes images, clear and large font	6 – 10 Discussion questions are clear but need more insightful Presenters need to make clearer conclusion and connections PowerPoint is somewhat organized and includes more images	1 -5 Weak discussion questions that lacked any insight Weak conclusions and connections PowerPoint needs to be more organized and logical

Equivalent Score $= \left(\frac{raw\ score}{total\ no.of\ items}\right) x\ 50 + 50$

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LE 3: ADVOCACY CAMPAIGN

Area to Assess	Beyond Expectation (16-20)	Expected (11-15)	Acceptable (6-10)	Unacceptable (1-5)
Brainstorming - Problems	Students identify more than 4 reasonable, insightful problems/ issues of the environment that needs to be addressed	Students identify at least 4 reasonable, insightful problems/ issues of the environment that needs to be addressed	Students identify at least 3 reasonable, insightful problems/ issues of the environment that needs to be addressed	Students identify lower than 4 reasonable, insightful problems/ issues of the environment that needs to be addressed
Brainstorming -Solutions	Students identify more than 4 reasonable, insightful possible solutions/strategies to encourage change.	Students identify at least 4 reasonable, insightful possible solutions/strategies to encourage change.	Students identify at least 3 reasonable, insightful possible solutions/strategies to encourage change.	Students identify lower than 3 reasonable, insightful possible solutions/strategies to encourage change.
Campaign Product	Student create an original, accurate and interesting product that that adequately addresses the issues	Student create an accurate product that that adequately addresses the issues	Student create an accurate product but it does not adequately addresses the issues	The product is not accurate.
Sources – Citation	Information in all source citations is correct an in the format assigned	Information in all source citations is correct but there are minor errors in formatting	Information in almost all source citations is correct but there are minor errors in formatting	Information is often incorrect or there are major errors in formatting

Equivalent Score $= \left(\frac{raw\ score}{total\ no.of\ items}\right) x\ 50 + 50$

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OTHER REQUIREMENTS AND ASSESSMENT ACTIVITIES (AA)
Aside from the final output, the student will be assessed at other times during the term by the following:

	Assessment Activity	Description and other Details	Course Outcomes it represents
AA1	Module Exercises/ Activities Required by the Teacher	You are required to answer and submit exercises of lessons in the module of the coursepack. Only those required by the teacher for submission will be submitted.	CO1, CO2, CO3

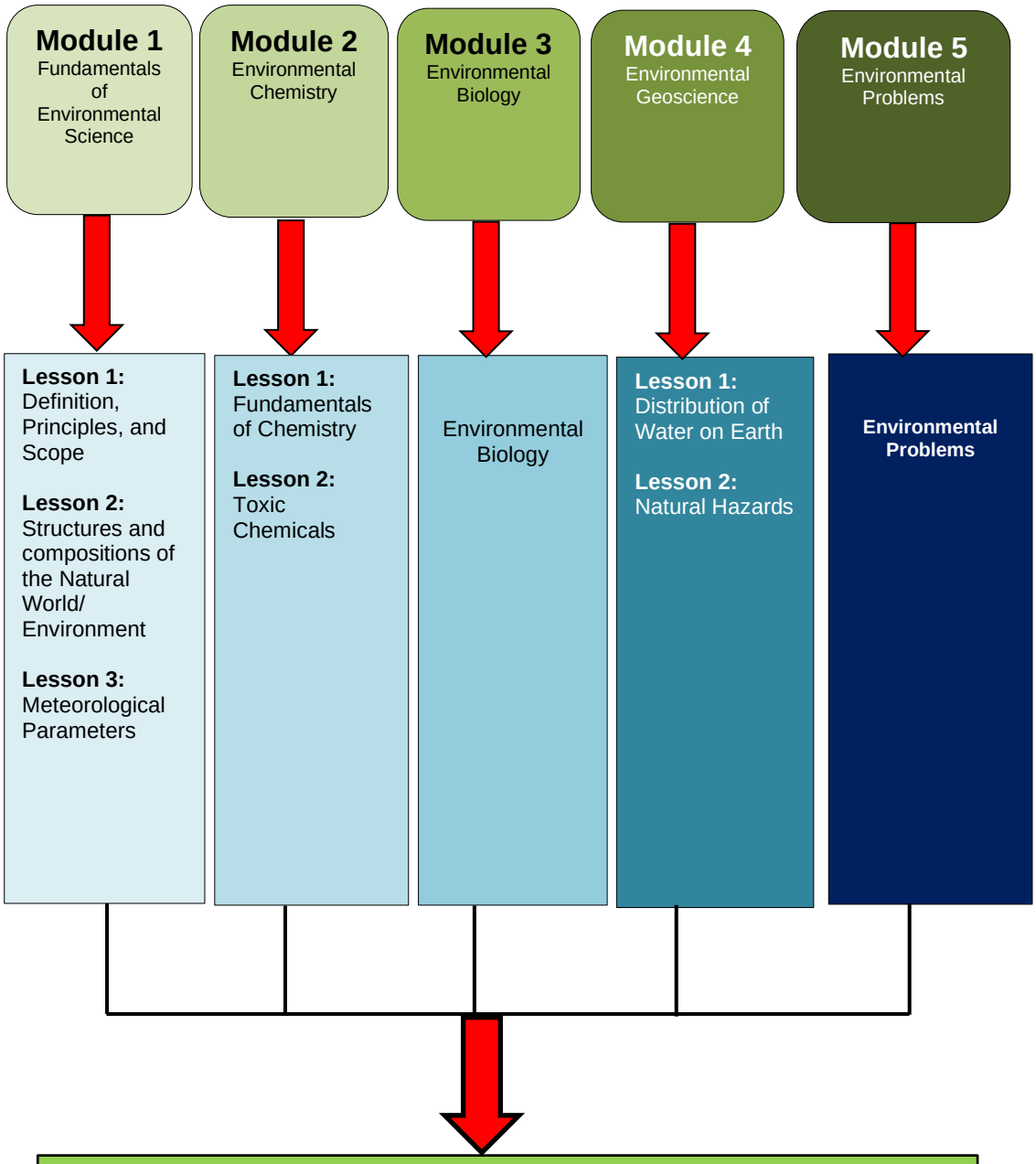
Grading System
The final grade in this course will be composed of the following items and their weights in the final grade computation:

Assessment Item	Grade Source (Score or Rubric Grade)	Percentage of Final Grade
AA1	Score	15%
LE1	Rubric	25%
LE2	Rubric	35%
LE3	Rubric	25%
TOTAL		**100%**

The Course Map

General Education Elective 3
(Environmental Science)

COURSE MAP



Outcome: Professional teachers who demonstrate concern for others, practice professional ethics, honesty, environmental concern, and sustainability.

MODULE 1
Fundamentals of Environmental Science

Module Overview:

The Environment is about the surrounding external conditions influencing development or growth of people, animal or plants; living or working conditions. Understanding it requires us to inquire three key questions: what is surrounded, by what surrounded and where surrounded. The answer to the first is living objects in general and man in particular. Human life is concerned to be the main in the study of environment. However, human life cannot exist or be understood in isolation from the other forms of life like animal life and from plant life. The environment belongs to all living beings and is thus important for all. In this module, you will discover what makes up Environmental Science and how it helps us understand this complex relationship between everyone and everything under the sun.

Module Outcomes:

In this module, you should be able to:

- Explain principles and scope of environmental science.
- Differentiate the structure of the components of the natural world/environment.
- Evaluate the importance of meteorological parameters.

This module is organized into 3 lessons:

- Definition, Principles, and Scope
- Structure and Composition of Atmosphere, Hydrosphere, Lithosphere, and Biosphere
- Meteorological Parameters

Lesson 1

Definition, Principles, and Scope

Learning Outcomes:

- Explain the principles and scope of environmental science.

Time Frame:
3 hours

Introduction

The fundamental insight of environmental science is that we are part of the natural world. Throughout the course of time, humans have gained the ability to interact and adapt better to their environment. In this lesson, you will discover what role environmental science plays to make all these progress possible. So ready those brains and those snacks 'cause we're starting!

Let's Get Started!

Web Quest!

How much "ology" do you know? Define the following terms by surfing through the internet. If you're up for it, you can even define them yourself! You'd be surprised to learn just how vast the grasp of science truly is!

Paleontology	
Agrostology	
Pomology	
Dendrology	
Entomology	
Herpetology	
Ichthyology	
Scatology	
Nephology	
Oology	

Let's Think About It!

Warm-up your brains with these questions:

a. *From the list above, which was the most intriguing for you and why?*

_____
_____
_____

b. *Why do you think scientists go out of their way to study the things mentioned above?*

_____
_____
_____

c. *What do you think are the limits of the term "Environment"?*

_____
_____
_____

Let's Explore!

How did the term "Environment" came to be?

The word 'Environment' is derived from the French word '*Environner*' which means to encircle, around or surround. The biologist Jacob Van Uerkal (1864-1944) introduced the term 'environment' in Ecology.

As defined by Environment Protection Act 1986, Environment is the sum total of land, water, air, interrelationships among themselves and also with the human beings and other living organisms.

The German biologist Ernst Haeckel in 1869 coined the word **"Ecology"** combining two Greek words – *oikos*, meaning "household" or "home" and *logos*, meaning "study of" – to coin ecology, the science that deals with the study of organisms in their natural home interacting with their surroundings ie., other living organisms and physical components.

An ecosystem comprises of: Abiotic, Producers, Consumers and Decomposers.

- **Abiotic** – These are nonliving substances that include factors like light, temperature, pressure, soil, water, carbondioxide, pH, mineral and chemical compounds. The physical and chemical components of an ecosystem constitute its abiotic structure which includes soil, geographical, climatic factors, energy, nutrtients and toxic substances.
- **Producers** – are to autotrophs mainly green plants, algae, etc., and they are further sub-divided into micro vegetation and macrovegetation. Producers can make their own food by using the carbon dioxide in the atmosphere, water and sunlight and chlorophyll in the leaves through the process of photosynthesis.

- **Consumers** – This is you, yeah you. The consumers are mainly heterotrophs like animals that feed on other organisms. They are further sub-divided into micro-consumers and macro-consumers.
  - *Herbivores* or primary consumers feed directly on producers.
  - *Carnivores* or secondary consumers feed on herbivores and if they feed on other carnivores known as tertiary carnivores.
  - *Omnivores* feed on both plants and animals.
  - *Detritivores* feed on the parts of dead organisms and wastes of living organisms.
- **Decomposers** – are heterotrophs which include mainly bacteria and fungi which derive their nutrition by decomposing and breaking down the complex organic molecules to simple organic compounds and ultimately into inorganic nutrients.

So, What's Environmental Science About?

The science of Environment studies comprises various branches of studies like:

• Chemistry • Physics • Life Science • Medical Science • Agriculture	• Public Health • Sanitary Engineering • Geography • Geology • Atmospheric Science
…And so many more!	

Environmental Science is the interdisciplinary field and requires the study of the interactions among the physical, chemical and biological components of the Environment with a focus on environmental pollution and degradation. Environment studies is a multidisciplinary subject where different aspects are dealt with in a holistic approach.

Here's an example to give you an idea of how this 'holistic approach' works:

Image Source: wired.com

Imagine a community utilizing a coal power plant.

- A community decides to use coal for electricity, as it is the cheapest source available. **(Economics)**
- The coal must be mined from under the soil. **(Geology)**
- The coal must be transported to the population center by road or rail. **(Engineering)**
- When it is burned at a power plant, air pollution is released. Some of that pollution is converted to acid in the atmosphere. **(Chemistry)**
- This falls as acid rain somewhere downwind. **(Meteorology)**
- The acid stresses plants by affecting their nutrient absorption. **(Ecology)**
- Laws are passed requiring the plant to install pollution scrubbers. **(Politics)**

Environmental Science also deals with the phenomena in the environment. It studies the sources, reactions, transport, effect and fate of a biological species in the air, water and soil and the effect of and from human activity upon these. Environmental Science deals with the study of processes in soil, water, air and organisms which lead to pollution or environmental damages and the scientific basis for the establishment of a standard which can be considered acceptably clean, safe and healthy for human beings and natural ecosystems.

The Scope of Environment

The environment consists of four segments of the earth namely:

- lithosphere,
- hydrosphere,
- biosphere, and
- atmosphere

Keep these terms in mind as we will expand on these four segments in the next lesson.

Image Source: usafa.edu

The scope of environmental studies is very wide and it deals with many areas like:

- Conservation of natural resources,
- Ecological aspects,
- Pollution of the surrounding natural resources,
- Controlling the pollution,
- Social issues connected to it, and

- Impacts of human population on the environment.

Elements of Environment

Environment is constituted by the interacting systems of physical, biological and cultural elements inter-related in various ways, individually as well as collectively. These elements are:

Physical elements
Physical elements are space, landforms, water bodies, climate, soils, rocks and minerals. They determine the variable character of the human habitat, its opportunities as well as limitations.

Biological elements
Biological elements such as plants, animals, microorganisms and men constitute the biosphere.

Cultural elements
Cultural elements such as economical, social and political elements are essentially man- made features, which make the cultural background.

Principles and Importance of Environmental Science

The environment studies make us aware about the importance of protection and conservation of our mother earth and about the destruction due to the release of pollution into the environment. The increase in human and animal population, industries and other issues make the survival cumbersome. A great number of environment issues have grown in size and make the system more complex day by day, threatening the survival of mankind on earth. The key to understanding the environmental problems that we encounter today is to learn about our ecosystem.

1. **Nature knows best**
   - This principle is the most basic and in fact encompasses all the others. Humans have to understand nature and have to abide by the rules nature dictates. In essence, one must not go against the natural processes if one would like to ensure a continuous and steady supply of resources.
2. **All forms of life are important**
   - Each organism plays a fundamental role in nature. Since such occupational or functional position, otherwise known as niche, cannot be simultaneously occupied by more than one specie, it is apparent that all living things must be considered as invaluable in the maintenance of homeostasis in the ecosystem.
3. **Everything is connected to everything else**
   - This principle is best exemplified by the concept of the ecosystem. In an ecosystem, all biotic and amniotic components interact with each other to ensure that the system is perpetuated. Any outside interference may result in an imbalance and the deterioration of the system.

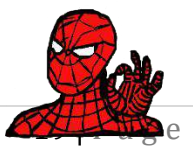
4. **Everything changes**
   - It is said that the only permanent thing is change. As a general classification, change may be linear, cyclical or random. As example of linear change is evolution of species, which has brought about higher and more complex types of organisms.
5. **Everything must go somewhere**
   - When a piece of paper is thrown away, it disappears from sight but it does not cease to exist. It ends up elsewhere. Gases released in smokestacks may disperse but it will end up a component of the atmosphere or brought down by rains. What a particular type of waste does to the earth's repository should be of concern to us. It may be a pollutant or a resource depending on certain factors.
6. **Ours is a finite earth**
   - There is no earth 2.0. Just how long would the earth be able to sustain demands on its resources? This is a question that needs serious reflection. Unless the factors of population growth, lifestyles, and polluting technologies are checked, the collapse of the earth might be inevitable.

Let's Do It!

The Alternate Reality: Imagine how different our world/environment would be if we did not incorporate and utilize some of the most vital scientific discoveries. Describe the possible realities we'll face in the following cases:

What if…	Alternate Reality
Chemistry wasn't developed.	
Physics wasn't explored.	
Nobody discovered the earth was a spheroid.	
Biology was non-existent.	
Michael Faraday was too lazy to pursue his work.	

Note: You might have to research some of these to refresh some ideas.



Closure

Awesome! You've just finished the first lesson of this module. Hopefully, this lesson gave you an idea on what Environmental Science is really about. A key take away you get from this is that knowledge is power! Science has changed our world a lot and that can imply something good and something bad. Always remember that great power comes with it great responsibility as well. We only have one world you know and we're the only ones that can take care of it. Now get set for the next lesson 'cause we're going to fly high! Literally!

Lesson 2

Structure and Composition of Atmosphere, Hydrosphere, Lithosphere, and Biosphere

Learning Outcomes:

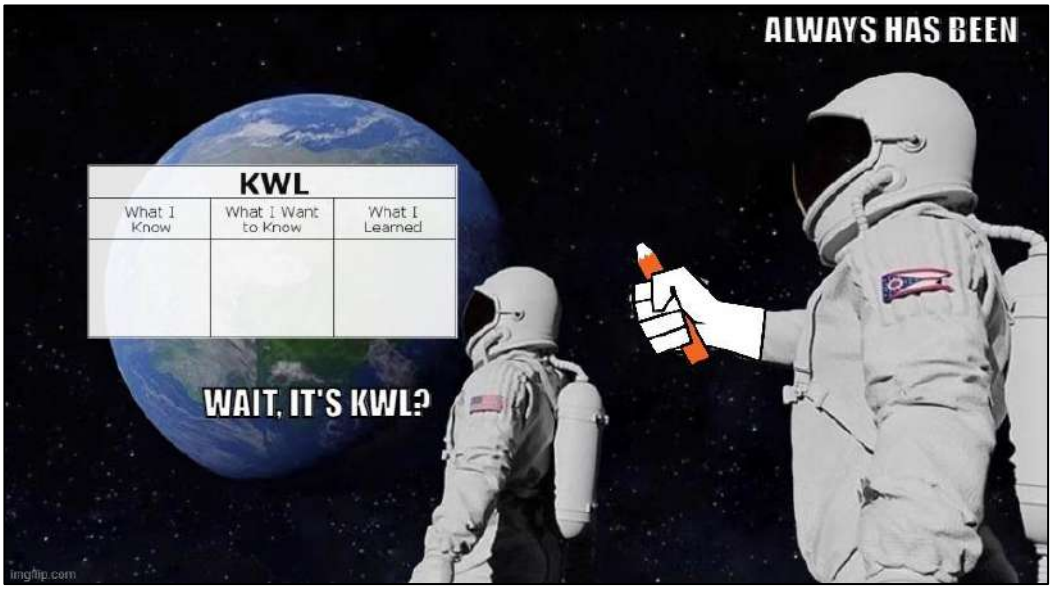
- Differentiate the structure of the components of the natural world/environment.

Time Frame:
3 hours

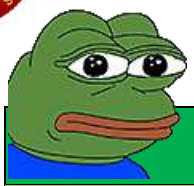
Introduction

Compared to the vastness of the universe, earth is but a small dot floating within a seemingly endless space. But guess what? This is our home and as the well known proverb tells it; there is no other place like it. Just like any average home owners, we have to know what's going on around the house. From the floors all the way to the roof so that we can fix what needs to be fixed and maintain what needs to be maintained. In this lesson, we will be doing just that. Let us discover the '-spheres' of the earth!

Let's Get Started!



KWL Chart: Fill in the chart focusing on the concepts in the left side. Use your prior knowledge only! Cheating would be a bad idea… 'cause I'm looking at you through that frog.



	What I know	What I want to know	What I learned
Lithosphere			Do this in the application section.
Hydrosphere			Do this in the application section.
Biosphere			Do this in the application section.
Atmosphere			Do this in the application section.

Let's Think About It!

a. *What do you think is the main function of our atmosphere?*
b. *Do you think it's possible for one sphere to be independent of the others?*
c. *How do these spheres interact with one another?*

Let's Explore!

The area near the surface surface of the earth can be divided up into four inter-connected geo-spheres that make up the carbon cycle these include the:

- Lithosphere
- Hydrosphere
- Biosphere
- Atmosphere

The understanding of '-sphere- in this situation means 'to surround or encompass'
The following help us understand what each of the spheres mean:

- **Litho**sphere - litho referring to rocks and minerals
- **Hydro**sphere - hydro referring to water
- **Bio**sphere - bio referring to life
- **Atmo**sphere - atmo referring to steam and vapor

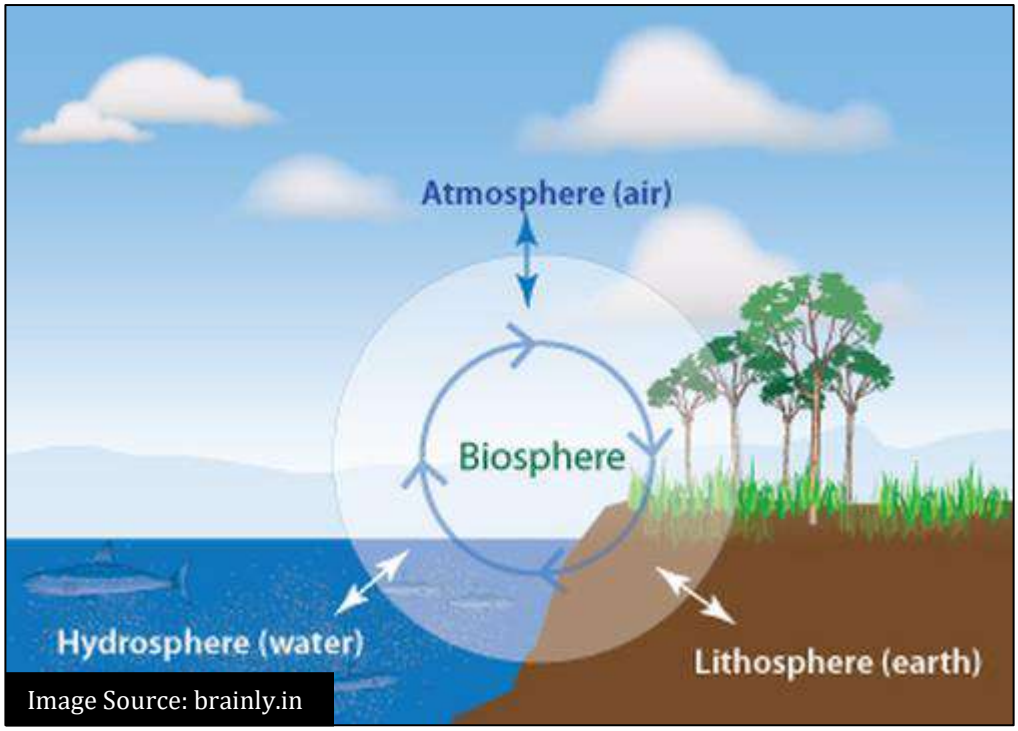


Image Source: brainly.in

Lithosphere
Lithosphere is the outer mantle of the solid earth. It consists of minerals occurring in the earth's crusts and the soil e.g. minerals, organic matter, air and water.

It is believed the lithosphere evolved about 4.6 billion years ago. The lithosphere refers to the solid, rocky crust that covers the entire planet. This solid, rocky crust is composed of a number of different rocks that have been hrouped into three categories based on how they are formed. These three groups include:

Igneous rocks

- Igneous rocks are formed by the cooling of hot molten rock also known as magma. When the hot magma cools it begins to harden meaning once it had fully cooled it create what is known to be an igneous rock.
- Some form below Earth's surface. Some form on or above Earth's surface. We describe these two basic types:

Intrusive igneous rocks
crystallize below Earth's surface, and the slow cooling that occurs there allows large crystals to form. Examples of intrusive igneous rocks are: diabase, diorite, gabbro, granite, pegmatite, and peridotite.
Extrusive igneous rocks
erupt onto the surface, where they cool quickly to form small crystals. Some cool so quickly that they form an amorphous glass. These rocks include: andesite, basalt, dacite, obsidian, pumice, rhyolite, scoria, and tuff.

- Here's how some of these rocks look:

Sedimentary rocks

- Sedimentary rocks are formed by the accumulation of sediments. Basically, when rocks erode and mix with other dirt, clay and particles then settle together they mix together to form a sedimentary rock.
- There are three basic types of sedimentary rocks:

Clastic sedimentary rocks

form from the accumulation and lithification of mechanical weathering debris. Examples include: breccia, conglomerate, sandstone, siltstone, and shale.

Samples:

Chemical sedimentary rocks

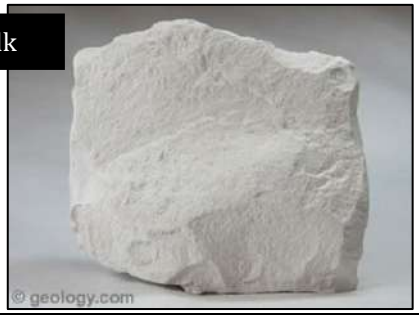
form when dissolved materials preciptate from solution. Examples include: chert, some dolomites, flint, iron ore, limestones, and rock salt.

Samples:

Organic sedimentary rocks

form from the accumulation of plant or animal debris. Examples include: chalk, coal, diatomite, some dolomites, most rocks in the sea/ocean and some limestones.

Samples:



Metamorphic rocks

- Metamorphic rocks have been modified by heat, pressure, and chemical processes, usually while buried deep below Earth's surface. Exposure to these extreme conditions has altered the mineralogy, texture, and chemical composition of the rocks.
- A good example is the sedimentary rock limestone turning into marble under the earth's crust.

Marble is a metamorphic rock that is produced from the metamorphism of limestone or dolostone. It is composed primarily of calcium carbonate.

The lithosphere includes a various number of different landforms such as mountains, valleys, rocks, minerals and soil. The lithosphere is constantly changing due to forces and pressures such as the sun, wind, ice, water and chemical changes.

Hydrosphere
The Hydrosphere comprises all types of water resources oceans, seas, lakes, rivers, streams, reservoirs, polar icecaps, glaciers, and ground water

The hydrosphere includes all forms of water in the Earth's environment. The forms of water include things such as the ocean, lakes, rivers, snow and glaciers, water underneath the earth's surface and even the water vapour that is found in the atmosphere.

Did you know?
Only about 1% of the entire earth's water is available as fresh water for human use. We get these from surface water like rivers, lakes, streams, and as ground water. Oceans represent 97% of the earth's water and the remaining 2% of the water resources is locked in the polar icecaps and glaciers.

The hydrosphere is always in motion as seen through the movement and flow of water in rivers, streams and the ocean (beach). Plant and animal organisms rely on the hydrosphere for their survival as water is essential. The hydrosphere is also home to many plants and animals and it believed that the hydrosphere covers approximately 70% of the earth's surface

Biosphere
Biosphere indicates the realm of living organisms and their interactions with environment, atmosphere, hydrosphere and lithosphere.

The biosphere, also known as the ecosphere, is made up of the parts of Earth where life exists. The biosphere extends from the deepest root systems of trees to the dark environment of ocean trenches, to lush rain forests and high mountaintops. It is the worldwide sum of all ecosystems.

Image Source: geography.name

Since life exists on the ground, in the air, and in the water, the biosphere overlaps with all the other spheres. Although the biosphere measures about 20 kilometers (12 miles) from top to bottom, almost all life exists between about 500 meters (1,640 feet) below the ocean's surface to about 6 kilometers (3.75 miles) above sea level.

The biosphere could not survive if it wasn't for the other spheres as all organisms need water from the hydrosphere, minerals from the lithosphere and gases from the atmosphere. Energy flow is essential to maintain the structure of organisms.

- **Does the biosphere include the cities human built?**
  - The answer is a big yes! The Biosphere includes ALL forms of life on the earth including the mites that constantly live in your face.
  - Here's a video to relax your mind a bit. After you watch this, you'll never have to be lonely again! 😉 https://www.youtube.com/watch?v=YW2eGaUzq7E

Atmosphere
The Atmosphere forms a distinctive protective layer about 100 km thick around the earth. A blanket of gases called the atmosphere surrounds the earth and protects the surface of earth from the Sun's harmful, ultraviolet rays. It sustains life on the earth. It also regulates temperature, preventing the earth from becoming too hot or too cold. It saves it from the hostile environment of outer space. The atmosphere is composed of nitrogen and oxygen besides, argon, carbon dioxide and trace gases.

It's believed that there are about 14 different gases that make up the atmosphere. The atmosphere is also responsible for the weather as the weather occurs within the lower atmosphere.

The atmosphere has a marked effect on the energy balance at the surface of the Earth. It absorbs most of the cosmic rays from outer space and a major portion of the electromagnetic radiation from the sun. It transmits only ultraviolet, visible, near infrared radiation and radio waves while filtering out tissue-damaging ultra-violate waves.

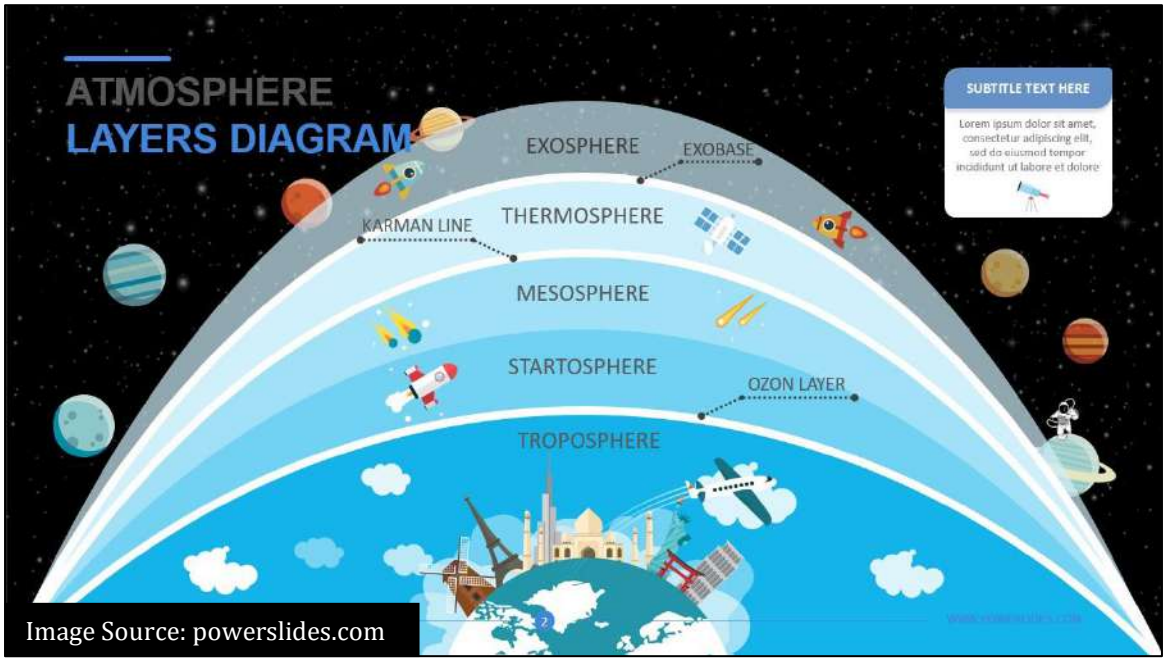


Image Source: powerslides.com

Troposhpere

The bottom layer of the atmosphere is known as the *troposphere*. The troposphere is where the weather happens. It is the warmest near the Earth because of the heat rising from the earth's surface but it becomes colder with altitude. This layer is separated from the next by what is know s as tropopause.

The tropopause is the point in which temperatures will begin to change due to the increase of altitude.

Stratosphere

Above the tropopause is the stratosphere. The *stratosphere* is where there large concentration of ozone gas is found. The ozone gasses are essential as they absorb a large percent of radiant solar energy, protecting the earth from harmful ultra violet rays also known as UV.

Mesosphere

The coldest of spheres is known as the *mesosphere* this is where the water vapor often freezes to create clouds that are purely made of ice. The mesosphere is separated from the thermosphere by the mesopause.

Did you know?
The mesosphere can reach temperatures below -118°C! The average household freezer only reaches -18°C! Here is where most meteors burn up. Without this layer, our Earth would be pocked like the Moon and other planets.

Theremosphere

The topmost layer is known as the thermosphere, this is where many satellites circle the earth. Due to the thin air and proximity of the sun, the temperatures in the thermosphere tend to rapidly increase and decrease.

Between the mesosphere and the thermosphere is the *Kármán line*. The line is an attempt to define a boundary between Earth's atmosphere and outer space. This is important for legal and regulatory measures; aircraft and spacecraft fall under different jurisdictions and are subject to different treaties.

Exosphere

The exosphere is the outermost layer of the Earth's atmosphere. It starts at an altitude of about 500 km and goes out to about 10,000 km. Within this region particles of atmosphere can travel for hundreds of kilometers in a ballistic trajectory before bumping into any other particles of the atmosphere.

Although the exosphere is technically part of Earth's atmosphere, in many ways it is part of outer space. The atmosphere is very, very thin in the thermosphere and exosph s still

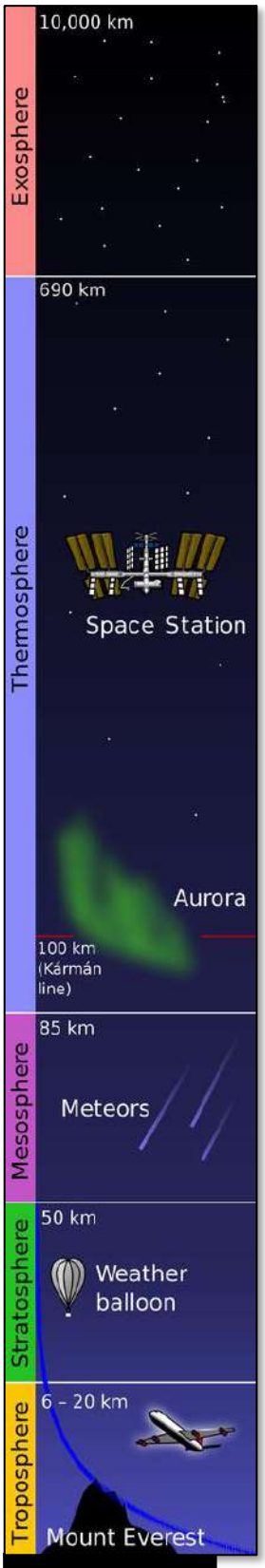


Image Source: zonanesia.com

enough air to cause a slight amount of drag force on satellites that orbit within these layers.

Let's Do It!
Task 1: Paste and complete your KWL Chart Here.

Task 2: Create a graphic organizer that shows the interwoven/overlapping relationship between all the spheres. You can use the space provided in the next page.

Closure
Great job! This lesson took you to a whole new level of heights didn't it? Get it? 😉 Hopefully, the lesson shed some light on the different geo-spheres and how they interact together to ensure the survival of all living things. Next up we will go more in-depth into this 'atmosphere' business so be sure to bring your umbrella. There might be meteors in the next lesson.

(Graphic Organizer)

Lesson 3

Meteorological Parameters

Learning Outcomes:

- Evaluate the importance of meteorological parameters.

Time Frame:
3 hours

Introduction

A chemist studies chemicals. A psychologist studies psychology. A geneticist studies genes. But the million peso question is; does a meteorologist study meteors? How about we find it out together in this lesson? And while we're at it, let's discover what meteorology is all about as well!

Let's Get Started!

My Thoughts.Jpg
How would you describe the relationship between humans and the environment? Share your thoughts below. Use the things you've learned from the previous lesson. You can even use an image/illustration to deliver your point.

Sample Image:

Click or tap here to enter text.

Let's Think About It!

a. What is meteorology for?
b. How does it contribute to the betterment of human civilization?
c. How different would our lives be without meteorology?

Let's Explore!

So… Is Meteorology about meteors?

Image Source: pinterest.com

As a matter of fact, it is.

While meteorologists do not study flaming rocks, they do however, study different kinds of meteors. You see, a meteor can be anything that falls through the air. So, raindrops, dust, and snowflakes can be thought of as atmospheric "meteors." Scientists have different names for different kinds of weather meteors.

The word meteorology comes from the Greek word, *meteoros* "high up" and *logia* "the study of". Therefore, the word means "the study of things high up / in the sky."

Meteorology is a branch of science that deals with the atmosphere of a planet, particularly that of the earth. The most important application of which is the analysis and prediction of weather.

Individual studies within meteorology include *aeronomy*, the study of the physics of the upper atmosphere; *aerology*, the study of free air not adjacent to the earth's surface; *applied meteorology*, the application of weather data for specific practical problems; *dynamic meteorology*, the study of atmospheric motions (which also includes the meteorology of other planets and satellites in the solar system); and *physical meteorology*, which focuses on the physical properties of the atmosphere.

Meteorology is one of the most important atmospheric sciences yet one that most of us do not think about too much. When we do, our immediate thought is to its usefulness in predicting weather. Yet it covers all aspects of the atmosphere, including atmospheric physics and chemistry.

What is Meteorology For?

Its most powerful uses are in weather prediction by looking at such phenomena as localized temperatures, water vapor levels, fluctuations in air pressure, wind direction and their responses to *Coriolis Effect*.

Image Source: news.abs-cbn.com

It seeks to predict what a weather system is going to do, even when otherwise seemingly erratic, to determine what conditions will be like over the next few days to a week, locally, regionally and even nationally. Such simple predictions sometimes have massive implications for workers in many fields coming to rely on these predictions. Meteorology is largely correct, but sometimes it goes wrong, showing just how reliant we are on understanding the weather around us. When they do get it wrong, it simply points to how erratic weather can be. Increasingly though, the tools and methods point to a high level of accuracy.

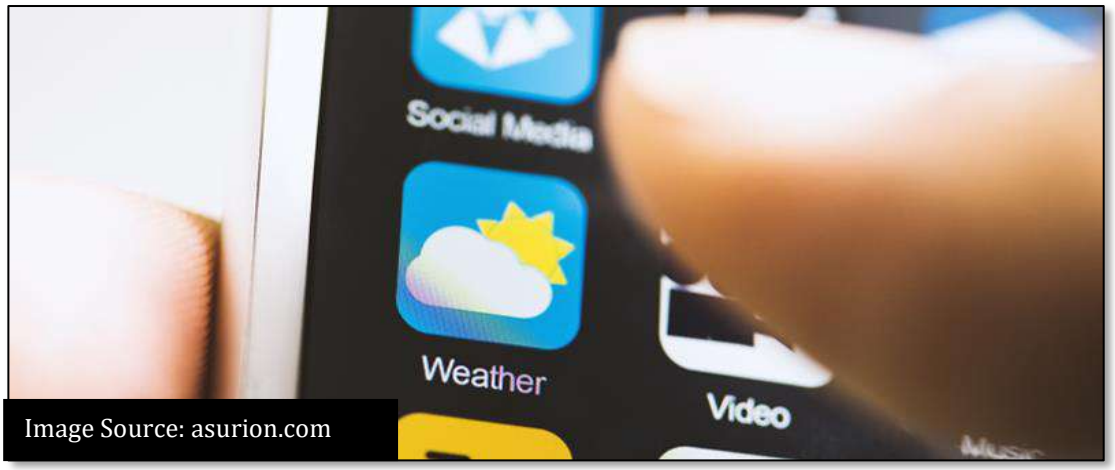


Image Source: asurion.com

Being able to accurately forecast the weather, more often than not, gets a bad rap, however, it is an essential tool we take for granted as we check our weather apps, listen to the news, or watch colors scroll across our screens depicting the most up-to-date radar simulation. Meteorology, in hindsight, actually plays a big role in ensuring our day-to-day convenience and overall safety.

Weather Patterns and the Coriolis Effect

Have you ever wondered why most storm clouds you see on TV are spinning/spiraling and look like this?

Or this?

This is because of the phenomenon called Coriolis Effect. This phenomenon cause fluid, like water and air, to curve as they travel across or above Earth's surface.

You can watch this very short but informative video to give you an idea of how Coriolis Effect works and how it affects the world's weather patterns.
https://res.cloudinary.com/dtpgi0zck/video/upload/q_auto/vc_vp9/v1/videos/What%20is%20the%20Coriolis%20Effect.webm?_s=vp-1.5.1

The key to the Coriolis effect lies in Earth's rotation. Specifically, Earth rotates faster at the Equator than it does at the poles. Earth is wider at the Equator, so to make a rotation in one 24-hour period, equatorial regions race nearly 1,600 kilometers (1,000 miles) per hour. Near the poles, Earth rotates at a sluggish 0.00008 kilometers (0.00005 miles) per hour.

The development of weather patterns, such as cyclones and trade winds, are examples of the impact of the Coriolis effect.

Cyclones are low-pressure systems that suck air into their center, or "eye." In the Northern Hemisphere, fluids from high-pressure systems pass low-pressure systems to their right. As air masses are pulled into cyclones from all directions, they are deflected, and the storm system—a hurricane—seems to rotate counter-clockwise.

In the Southern Hemisphere, currents are deflected to the left. As a result, storm systems seem to rotate clockwise. Outside storm systems, the impact of the Coriolis effect helps define regular wind patterns around the globe.

Did you know?
The only difference between a hurricane and a typhoon is the location where the storm occurs. In the North Atlantic, central North Pacific, and eastern North Pacific, the term hurricane is used. The same type of disturbance in the Northwest Pacific, where the Philippines is situated, is called a typhoon.

Other Applications of Meteorology

The most obvious public face of the science of meteorology is in weather forecasting. Every time we turn on the news to understand how our local weather

is going to look for today or next few days, we are utilizing one of the most common applications of meteorology. But surprisingly, there's a lot more to this filed than what meets the eye.

a. Commodity Trading / Agricultural Meteorology

- Perhaps one of the most surprising ways in which meteorology is applied is in commodities trading. Stocks and shares trade is one area of employment for meteorologists, especially when the dealing with commodity crops such as coffee which is affected by adverse weather conditions. These organizations trade based on longer-term weather forecasting and what a crop harvest is going to look like in a certain year.
- Meteorology also determines when farmers should sow, when they should reap, and what steps they will need to take to protect crops from erratic weather. They may need to engage in flood mitigation or effective water management during drought to protect from crop failure.

b. Aviation Meteorology

- This division of meteorology deals with military and commercial flying and weather conditions in the upper levels of the atmosphere. Even when the weather is good at ground level, it doesn't mean the same conditions apply 30,000ft. Aviation meteorology is the applied science that dictates air traffic - whether a route is safe or dangerous, at what times, and whether flights can be made at all.

c. Maritime / Marine Meteorology

- Where conditions on land are vital for agricultural workers, those who work at sea - industrial fishing, oil and gas rigs, military navy, commercial shipping, all need up-to-date information on the weather conditions where they are or where they are going to dictate operations. They need to take action to avoid or mitigate the effects of extreme weather at sea, such as storms and hurricanes.

Let's Do It!

Task 1: Me, an Intellectual

Research on how meteorology affects these common facets of our lifestyles. If you think you can answer it on your own without relying on the internet, then I tip my hat to you, Mr./Ms. Intellectual.

Aspects of Life	How Meteorology Influences It
Clothing/Fashion	
Communication	
Gadgetry/ Technology	
Food/Supply	

Entertainment/ Movies/ Songs	

Closure

That's it for this lesson! Great job! While short, we still hope you had gained a better understanding about the applications and importance of meteorology. This lesson also marks the end of Module 1. So give yourself a pat on the back and a handshake for your efforts. Take a well deserved break and gear up for module 2!

MODULE SUMMARY

- ✓ Environmental Science is the interdisciplinary field and requires the study of the interactions among the physical, chemical and biological components of the Environment with a focus on environmental pollution and degradation.
- ✓ Environment is the sum total of land, water, air, interrelationships among themselves and also with the human beings and other living organisms.
- ✓ An ecosystem comprises of: Abiotic, Producers, Consumers and Decomposers.
- ✓ The area near the surface surface of the earth can be divided up into four inter-connected geo-spheres that make up the carbon cycle these include the Lithosphere, Hydrosphere, Biosphere, and Atmosphere.
- ✓ The biosphere could not survive if it wasn't for the other spheres as all organisms need water from the hydrosphere, minerals from the lithosphere and gases from the atmosphere.
- ✓ Meteorology is a branch of science that deals with the atmosphere of a planet, particularly that of the earth. The most important application of which is the analysis and prediction of weather.

MODULE ASSESSMENT

Module assessment is the sum of all the assessments given in the “let’s do it” part of the each lesson.

To Recap:

Lesson 1 – AA1

Task 1 – The Alternate Reality: Imagine how different our world/ environment would be if we did not incorporate and utilize some of the most vital scientific discoveries. Describe the possible realities we’ll face in the following cases:

Lesson 2 – AA1

Task 1 - KWL Chart: Fill in the chart focusing on the concepts in the left side. Use your prior knowledge only! Cheating would be a bad idea… ‘cause I’m looking at you through that frog.

Task 2 – Graphic Organizer: Create a graphic organizer that shows the interwoven/overlapping relationship between all the spheres. You can use the space provided in the next page.

Lesson 3 – AA1

Task 1 – Me, an Intellectual: Research on how meteorology affects these common facets of our lifestyles. If you think you can answer it on your own without relying on the internet, then I tip my hat to you, Mr./Ms. Intellectual.

References

Cunningham, William, and Mary Ann Cunningham. 2020. *Environmental Science: A Global Concern*. 15th ed. McGrawHill.

Enger, Eldon, and Bradley Smith. 2002. "Environmental Science: A Study of Interrelationships." *McGraw Hill* 77(1):92–92. doi: 10.1086/343664.

Lumen. n.d. "The Atmosphere | Earth Science." Retrieved March 20, 2021 (https://courses.lumenlearning.com/earthscience/chapter/the-atmosphere/).

Maso, Matthew. 2016. "Meteorology: Something in the Air | EnvironmentalScience.Org." Retrieved March 22, 2021 (https://www.environmentalscience.org/meteorology).

Pimm, Stuart. n.d. "Ecology | Britannica." Retrieved March 20, 2021 (https://www.britannica.com/science/ecology).

Reichard, Jim. 2020. *Environmental Geology*. 4th ed. McGrawHill.

Society, National Geographic. 2011. "Coriolis Effect." *National Geographic Society*. Retrieved March 22, 2021 (http://www.nationalgeographic.org/encyclopedia/coriolis-effect/).

Society, National Geographic. 2012. "Meteorology." *National Geographic Society*. Retrieved March 22, 2021 (http://www.nationalgeographic.org/encyclopedia/meteorology/).

Thompson, Michael. n.d. "Biosphere | Definition, Resources, Cycles, Examples, & Facts." *Encyclopedia Britannica*. Retrieved March 20, 2021 (https://www.britannica.com/science/biosphere).

UCAR. n.d. "Earth's Atmosphere | UCAR Center for Science Education." Retrieved March 20, 2021 (https://scied.ucar.edu/learning-zone/atmosphere/earths-atmosphere).