DEVELEPOING ENVIRONMENT POLLUTION AWARENESS AMONG STUDENT OF 9^(TH) CLASS THROUGH BIOGEOCHEMICAL CYCLE.

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Guide :   **Researcher**

Prof. R.S.Mani   **Rachna barot**

DEPARTMENT OF EDUCATION (CASE, IASE, IUCTE)

FACULTY OF EDUCATION & PSYCHOLOGY

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VADODARA-3

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Department of Education [CASE & IASE]

Faculty of Education and psychology

The Maharaja Sayajirao University of Baroda

Vadodara – 390002

Phone no. 0265 2795516

E-mail: head-edu@msubaroda.ac.in

CERTIFICATE

This is to certify that the dissertation titled "developing environmental awareness among students of class 9th through biogeochemical cycles." which is being submitted by Rachna Barot towards the partial fulfillment of the requirement for the degree of Masters of Education (M.Ed.) through Department of Education, Faculty of Education and Psychology, the Maharaja Sayajirao University of Baroda, Vadodara is the students own work carried out under my continuous supervision and guidance and has completed it to my satisfaction.

Vadodara

Prof. R.S.MANI SIR
Department of Education
Faculty of Education and Psychology
The Maharaja Sayajirao University of Baroda
Vadodara

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Vadodara
(Rachna Barot)

Department of Education [CASE & IASE]

Faculty of Education and psychology

The Maharaja Sayajirao University of Baroda

Vadodara – 390002

Phone no. 0265 2795516

E-mail: head-edu@msubaroda.ac.in

DECLARATION

I, Rachna Barot hereby declare that the dissertation entitled "developing environmental awareness among students of class 9th through biogeochemical cycles " conducted and submitted by me for the partial fulfillment of the Masters of Education Programme at the Department of Education, Faculty of Education and Psychology, the Maharaja Sayajirao University of Baroda, Vadodara. It is my original work and has not been submitted earlier either to The Maharaja Sayajirao University of Baroda or any other institute for any course requirement. I also declare that no chapter of this dissertation in whole or in part is taken from any earlier work done either by me or any other person.

Vadodara   Rachna Barot

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CONCEPTUAL FRAMEWORK

1.0 INTRODUCTION

Environment includes the living and nonliving things that an organism interacts with, or has an effect on it. Living elements that an organism interacts with are known as biotic elements: animals, plants, etc., abiotic elements are non living things which include air, water, sunlight etc. Human life the best creation of God has got two aspects: the biological and sociological or cultural. While the former is preserved and transmitted by food and reproduction, the later is preserved and transmitted by "Education". The Biological aspect is found in plants and animals life also. But the sociological or cultural aspect is the rare distinction of human life alone. It is only „Man‟ who is capable of being educated. Through education he tries to seek new ideas and new ways of life and he promotes his intelligence and knowledge. (Ecology, 1995, pp203).

Human being as social animal tries to understand the atmosphere even from birth. There is a need to guide them, to let them, and bring them to better development and adjustment for these "Education is necessary for imparting experiences in the light of social development" (H.K. KAPOOR – 1962). Education is a lifelong process, it place a very important role in every one life. When a person gets education his/her knowledge get increase day by day. They start thinking with their own, they are capable to take their decision and they can understand and co-relate the things with their surrounding and can face any problem and can do work independently. "It is through education he/she is transformed in to human social, moral and spiritual being". (Rai, B.C. -1991).

Environment in education have great impact an environment also play an important role in education because the individual is surrounded with many things in environment. They learn from environment by doing the things by experiences, by mistakes made by them, by their own opinion. In environment there are five elements fire, water, land, flora and fauna which are interconnected and interrelated. If there is deterioration in anyone, it affects other four elements and natural environment at large. To protect and conserve the environment, environment awareness is needed. It can be created by various way among them environmental education is one way were student and the people are aware about environmental problems. So that they will be motivated to conserved natural resource and find out the way to short out the environmental problems. The meaning of environment is conditions of life. It means how the surrounding is acting in environment. All human activities like working, breathing, eating, etc are also influenced by environment if there is any change is surrounding like climatic change, weather changes etc its impact is seen on human activities.

1.1.0 CONCEPTUAL FRAMEWORK OF ENVIRONMENT:

The growing concern about environment made many to think and explore the concept, nature, significance and development of natural environment. The term environment has been derived from the French word Environed, which means to encircle or surround. It was used to refer the elements envelope the living beings and the earth. The French naturalist Etienne Geoffrey Saint-Hilahe used the term 'milieu ambient in 1835 to state the dependence of organisms upon its physiographic surroundings. Douglass and Holland in their attempt to define the term environment highlighted the influence of physical factors over the growth, behavior, development and maturity of living organisms.T.D. Elliot identified the influence of physical factors as an agent of effective external stimulation and interaction of any unit of living Matter. The cultural element has been added as another dimension by chhatwal as he viewed the environment as inseparable whole and interacting systems like, physical, biological and cultural elements which are interrelated individually as well as collectively in myriad ways. Two basic factors of environment are it is indivisible and has no geographical or ideological frontiers moreover it is common to all living organisms like, man, animals and plants. Along with physical elements like air, water and land its inten'elationship with the living organisms has been stressed in the Environment (protection) act of 1986. The concept has been defined, as all the physical and biological surroundings and their interactions.* Moreover people belong to the different professions and the different disciplines understand the term in their own perspective. The ecologists, the geographers, anthropologists, architects, engineers, doctors, psychologists use the term in different sense. Environment is holistic in nature consisting of its different physical, biological, social, cultural, economic, political etc., dimension, which is interrelated, with an independent of each other. The holistic nature is dynamic, which continually undergoes changes and^ develops towards a more Sstable holistic state.

These concepts on Environment may be classified as (a) Natural environment consisting of elements like, air, v^ter, soil, mountains plants, rivers forest and the living organisms etc (b)'Man Made Environment such as, the villages, cities, industries and other institutions like buildings, roads canals, agriculture, transport, etc. (C) Social environment consists of social systems its economic structure and culture and its influence on the population growth, employment, commerce, values etc. The environment can also be categorized as (non-living) and biotic (living) components. However it is taken to mean all those elements, which are physical and chemical, organic and non-organic components of the atmosphere, lithosphere and oceans that encompass the whole of earth.

To sum up the environment may be considered as consisting of circumstances, objects or conditions by which one is surrounded. Environment includes the complexes of climatic and other constituent factors like soil, biological bodies which act upon the organism or an ecological community. It could denote the phenomenon of existence around an area, in which the entire masses of animate as well as inanimate are an integral part. It connotes the entire philosophy on

which the very survival of human race has balanced itself. It is not only the food for human development but also a lifeline for human existence.

1.2.0 ENVIRONMENTAL POLLUTION.

Pollution refers to the addition of unwanted substances (pollutants) or effects that adversely alters the natural or man-made environment.^ It is an undesirable change in the physical, chemical or biological characteristics of our natural resources like air, v^ter and soil. These changes affect the living organisms and become a source for health hazards. The changes occur due to any chemical (e.g. oregano phosphorus compounds, DDT etc) or geochemical elements, (e.g. dust and sediments) or substances or sometimes biological organisms and their products.^ The level of the environmental pollution can be estimated according to the changes in geographical distribution of various groups of organisms and also their morphological, cytological, physiological, biochemical and chemical changes. Disturbance in the natural cycle build ecological Imbalance, a root cause of environmental pollution. Unscientific extraction and disposal of the natural resources alter the natural cycle adversely so as to add a composite article, which the ecosystem has failed to recycle. The synthetics and the composites are the two groups of materials a contribution of newer technologies that pose problems of disposal and recycling. Synthetics are the by product of fossil fuel, e.g., plastics, and the composites are a group of materials consists of the metals and non-metals reinforced by fibers of such materials such as glass, carbon and boron. The pollutants like, mercury, lead, oil, carbon dioxide, nitrogen, waste heat, pesticides, nuclear radiation, and noise, etc, have caused immense damage to natural resources like air water and soil that supports animal and plant life.

The pollutants can be categorized under non-degradable and biodegradable pollutants^ based on the time taken to get degraded in the environment. The substances of an ecosystem undergo naturally occurring cyclic process. However the Non-degradable pollutants like polychlorinated biphenyls or PCBs, and dioxins, plastics, aluminum, mercuric salts, DDT etc are chemical substances that get accumulated and do not degrade into harmless components, remain in the state for a very long period of time. Its cyclic process is very slow or never. Biodegradable pollutants are nutrients and other materials that can be easily broken down and absorbed In the environment within a short period of time. As a result they do not get accumulated in the environment. But they do create problems when they are released into environment in large quantities. The pollutants are categorized based on its type like: smoke pollution, lead pollution, radioactive pollution, noise pollution, air pollution, water pollution and land or soil pollution, etc. Every pollutant has its own origin, pathways and affects but all the pollutants can spread throughout the biospheres thorough air, land or water.

1.3.0 ASPECTS OF ENVIRONMENTAL POLLUTION:

One of the most obvious types of pollution results from the combustion of fossil fuels (coal + oil). Due to 'thermal inversion' the combustion produces are trapped and high

concentration of harmful substances including sulphur compounds and hydrocarbons builds up. The use of DDT, pesticides, leads, and radioactive materials pollute the atmosphere and the discharge of sewage into the water threatens the aquatic life.

1.4.0 COMPOSITION OF ATMOSPHERE AIR:

Million and billions years ago the atmospheric air mainly consisted of ammonia, methane and water vapors. Photosynthetic reactions evolve oxygen to atmosphere and make the atmosphere rich in oxygen.

TABLE 1.1 Composition of atmosphere air:

Gasses	Symbol/Formula	Percentage
Nitrogen	N_2	79
Oxygen	O_2	20.9
Carbon Dioxide	CO_2	0.03
Methane	CH_4	0.07 (Total Sum)
Sulphur Dioxide	SO_2	
Ammonia	NH_3	
Hydrogen Sulphide	H_2S	
Carbon Monoxide	CO	
Hydrogen	H_2	
Argon	Ar	

A natural equilibrium exists among the composition of gasses. In normal and free environmental process the percentage of earth gasses remain constant although there are several reactions which take place within the atmosphere. In cyclic order conversation of gases takes place from one form to another form but the percentage remains conserved.

1.5.0 TYPES OF ENVIRONMENTAL POLLUTION:

1.5.1 AIR POLLUTION:

Air is a mechanical mixture of different atmospheric gases. The contamination of air with dust, smoke and harmful gases are called air pollution. Air pollution is generally accomplished

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through the pollutants of gases and solid and liquid particles of both organic and inorganic chemical. Gases such as sulphur dioxide, carbon monoxide, hydrogen sulphide and emissions from volcanoes, swamps, dust, salt spray pollens from plants, etc., are continuously added to the air as a result of natural processes. According to the section 2 of the air (prevention and control of pollution) act 1981, air pollution means the presence of unwanted solid, liquid or gaseous substances in the atmosphere in such a concentration as may be or tend to be ingenuous to human beings or other living creatures or plants of property or environment. Burning large amount of fossil fuels, cutting forests and reducing ocean planktons by pesticides and oil spills have altered the proportion of atmospheric gases and left out thousands of tones of solid waste in the form of dust, smoke and toxicant matters and atmospheric impurities. Thus the air is polluted both by natural or man-made activities.

Table 1.2 Air pollution: Pollutants, Sources and its Effects

Pollutants	Sources	Effects
carbon monoxide and carbon dioxide	automobile exhaust, respiration of living animal	• Atmosphere temperature • Health problem • Green house effect • Reduced tolerance for exercise • Impairment of mental function • Increased general mortality and coronary morality rates
Sulphur Dioxide	combustion of sulphor bearing fossil fuels, electric power plant, copper, lead and zinc smelting industries, oil refineries, sulpheric acid, manufacturing industries, paper industry, pulp industry, fertilizer industry	• Aggregation of respiratory diseases eg. Asthma and chronic bronchitis • Impairment of pulmonary function. • Corrosion of metal • Deterioration of building materials, textiles, • Acid rain
Hydrogen sulphide and organic sulphid	Industry, gas refining, manufacturer of coke,	municipal workers engaged in sewage work

	distillation of tar and petroleum, viscose rayon, chemical process	
Nitrogen dioxide	automobile exhaust, chemical industry, manufacturer of nitric acid and sulphric acid by chamber process, manufacturing of nylon intermediates	• Aggravation of respiratory and cardiovascular illness • Discolor atmosphere • Damage to vegetation • Fading of paints and dyes • Increased storage in body.
Hydrocarbons Aldehydes, organic Acid,	incomplete combustion of petroleum fuel and natural gas, oxidation of lubricating oil, from primary pollutant these pollutants are formed by chemical reactions	• Sensory irrigation • Ozone layer depletion
Metal mercury lead, zinc	production of fungicides paints, cosmetic, paper pulp volatile lead halides copper lead and steel refineries	• Nervous system, liver and eye • Development and maturation of red blood cells • Lethal to animals eating in feed
Dust	dust from wood work. Entrained by process gases i.e. from coal, sand from sanding blasting	• Respiratory system of human • Affect eye • Affect lungs

1.5.2 WATER POLLUTION:

Water pollution occurs when chemicals or nutrients enter water faster than natural processes can remove them. The pollutants include sewage, oils, silt, industrial chemicals and heavy metals, chemical from the air dissolved in rain water and pesticides, fertilizers and herbicides leached from the land Waste heat from industry, discharged without cooling, with the used coolant water, is also a pollutant. All of these pollutants can have senous implications for life According to World Health Organization (1966) water pollution.

According to World Health Organization (1966) water pollution is 'Foreign matenals either from natural and other sources are contaminated with water supplies and may be harmful to life, because of their toxicity, reduction of normal oxygen level of water, aesthetically unsuitable effects and spread of epidemics.

Putting anything unwanted and harmful, into the water, which was not there in its natural states forms water pollution ^^ Therefore, one would agree that most of the problems of water pollution are man made and are the result of indiscriminate and unwise use of water bodies and its management. The polluted water changes its quality or composition and when it is used for drinking, it spreads deadly diseases such as typhoid, cholera, dysentery, jaundice and other viral diseases.

Water pollution comes from point and non point sources Point sources include pipe outlets and other direct and observable sources of pollution These may be easily identified and controlled Non-pomt sources include acid perspiration (ram) and the run-off (the water that drains off) of fertilizers from large areas (the fertilizers mix with the irrigation water and flow off into nearby water bodies). These pollution sources are complicated and difficult to identify and control Despite controls to minimize spills (spilling of oil), technological snag and human error during oil dining operations, accidents and disasters are common because of which the surrounding waters are polluted Moreover oil refinances are known for the emission of huge quantities of pollutants into air and water. Stagnant waters (e.g., lakes, ponds) are more easily polluted than flowing waters (e.g., rivers, streams) as pollutants tend to accumulate in the former However in the latter the pollutants spread faster and further Though water as other natural substances has self purifying capacity during recycling processes, increase in the agricultural and industrial activities during recent years has led to water shortage and pollution. Water pollution, a purely man-made phenomenon, s caused due to heavy influx of household wastes and factory effluents beyond the self purifying limit of a water channel. In rural areas of developing counters like India water-borne diseases are increasing at alarming rate.

Table 1.3 water pollution: pollutants, sources and its effects

Pollutants	Sources	Effects
Sewage	Municipal Sewage. Human and animal excreta, cloth, rotten fruits, soaps, organic and inorganic contain contaminants.	A street municipal worker
Industry	Paper and pulp, textiles, fertilizers, non-ferrous and ferrous metals, rubber, petrochemical, leather industry, oil, greases, plastics, toxins, suspended, particles,	Polluted to atmosphere Affect respiration

	organic & inorganic materials	
Agricultural discharges	Chemical fertilizers .pesticides herbicides fungicides	Affect soil, water and aquatic animals
Acids Sulphoric Acid Hydrochloric acid Nitric acid Phosphoric acid	Manufacturing of chemicals Fertilizers Batteries DDT Electroplating Mining Fermentation Manufacture of leather, Kier liquors	♦ Damage concrete structures by corrosive activity ♦ Produce hydrogen sulphide in contact with sludge and mud of river leading to higher degree of atmospheric pollution ♦ Destroy micro organisms i.e fish and aquatic animals
Alkalis	♦ Wool scouring wastes ♦ Tannery wastes ♦ Cotton mercerizing waste	♦ Destroying bacterial and other micro-organism ♦ Produced asphyxiation by the coagulation of gill secretions of fish ♦ Formation of hydrogen ions
Fat, soaps, and waxes	♦ Wool scouring. ♦ Oil and fact refining ♦ Higher fatty acid	♦ Lower fatty acid produces unpleasant, rancid odors. ♦ Change the composition of water
Gaseous pollutants (ammonia, free chlorine, hydrogen sulphide, ozone and phospine)	♦ Manufacture of chemicals. ♦ Fertilizer and ♦ Gas and coke	♦ Increase the ammonia content to dangerous level. ♦ Produce spasm of the glottis and may also lead to death. ♦ Poison to fish. ♦ Hydrogen sulphide is local irritant and act as a respiratory depressant causing conjunctivitis, bronchial irritation and oedema of lungs in man.

1.5.3 SOIL AND LAND POLLUTION:

Soil pollution usually results from the disposal of solids and semi-solids wastage's in agricultural practice and in sanitary habits.

Soil is another natural resource like air and water which supports life. The excessive use of fertilizers, pesticides, herbicides and improper disposal of solid wastes contaminates it. Soil is becoming increasingly polluted with toxic chemicals and heavy metals reach the food chain and endanger the human life.

The decrease in the quality of soils either due to human activities or natural sources or by both is known as soil pollution or soil degradation. Soil pollution IS a common phenomenon in urban areas and is increasing at a terrific rate owing to indiscriminate dumping of city garbage, industrial wastes, using sewage water for irrigation, and unscientific use of chemical fertilizers and insecticides, etc In the rural areas of developing countries like India soil is comparatively free from toxic and harmful substances but increasing use of chemical fertilizers, insecticides and canal irrigation, etc, to increase the food production has made the soils vulnerable to pollutants Some social habits associated with open drains, garbage disposal and field iavatones are not less responsible for contaminating the village lands .

Land pollution is both a natural and social hazard. The fertility of soil Is diminishing on account of dust storms, floods and irrational use of irrigation. The problems of soil erosion and salinity of the soil have come up our mother-earth has been invaded and land pollution is increasing.

Table 1.4 soils and land pollution: pollutants, sources and its effects

Pollutants	Sources	Effects
Industrial and urban wastage	Disposal of industrial solid Domestic refuse	• Poison the soil or crops • Enter into ground level water • Public Health problems(25 human diseases) are associated with solid wastes. • Increasing rates and flies • (70,000 flies are produced in 0.027cubic meter of Garbage) • Causes dysentery, diarrhea etc
Agricultural practice	Using fertilizers Pesticides	Affect the water of low land lakes and rivers • Soil water polluted and Affect food

Acid Rain:

Acid rain is caused mainly by the presence of oxides of sulphur and nitrogen in the atmosphere, where the rain precipitation occurs.

From industry, power plants, petroleum refineries sulphur dioxide (SO2), and nitrogen oxide (NO) are evolved and mixed in the atmosphere. The conversation of S02 and NO to sulphoric and nitric acids are given in the following equation.

 2 S02 + 02 2 S03

SO3 +H20 -»H2S04 (Sulphuric acid)

2NO + 02 2N02

4 N02 + 2H20 +02 –*4 HN03(Nitric Acid)
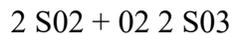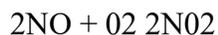
Sulphuric acid and nitric acid come back to earth at the time of rainfall with water. This is called as acid rain. Due to acid rain the problem raised are corrosive of building, increasing acidity of soil etc.

Green House Effect:

Green house is a glass house in which delicate plants need warmth and protection from several types of weather and grown. The glass panels fitted on the roof allows the sunlight to pass inside but does not allow going back as the radiated light with low energy. So heat remains within the glass keeps the house warm. The same phenomena occurs in earth Carbon dioxide (C02) concentration present in our atmosphere is acting as a glass house which allow the sunlight to pass to the earth, but the heat radiated from earth does not pass through the C02 layer. By this in the night earth becomes hot, otherwise the minimum temperature falls which may smash the entire life. In other planet C02 layers do not present by which existence of life is not possible. This is called Green House Effect. Due to tremendous increase in quantity of C02 at the rate of 4% per decade, CFG, methane, oxides of nitrogen from different sources they make C02 layer as thick tends to global warming.

Table 1.5 Extents of Pollutant Gases on Global Warming

Sr.no	Gases Pollutant	Contribution to Global Warming (in percentage)
1.	Carbon Dioxide	57
2.	CFCs	25
3.	Methane	12
4.	Oxides of Nitrogen	06

As an effects global warming leads to melting of polar ice cap, alternation in the rainfall pattern, affecting flora and fauna along with human lives.

Ozone Layer Depletion:

The upper region of the atmosphere is stratosphere .Its layer mainly containing ozone is called ozone layer. It absorbs the sun's harmful ultra-violate radiation preventing the human being from different diseases. The ultra violate rays penetrate the human body and plants creating different diseases such as skin cancer and blindness in human being destroying the green pigment of plants etc. This ozone layer is deflected by CFCs (Cloro-floro Carbons) emitted due to pollution.

After conservation of ozone to free oxygen holes are created in the layer of ozone which is called as ozone layer deflection.

Effects:

1. Ultra-violate rays pass through this hole comes to earth surface causing harmful effect on human and plants.

2. Variations in global warming,

3. Ecological disturbance,

4. Dwindling of global food supplies.

1.6.0 ENVIRONMENTAL POLLUTION AWARENESS:

The industrial revolution in the world started after 16th century. The decay of environment was accelerated in all possible ways. Environmental pollution broke out like a wild fire within only three hundred years. For meeting the ever green need, people put pressure on the environment. When the pressure exceeded the critical limit of carrying capacity of the environment to replenish itself, it created a serious problem of environment degradation. Therefore, there is a social need to create 'awareness' about environment protection. while efforts are being made at the national and international level to protect our environment, it is also the responsibility of every citizen to use the environmental resources with more care and protect them from further degradation. To combat the effect of terrible lash of environmental decay in water, air and soil the whole human civilization became very careful. Ultimately this fighting could be started at grossroot level through the education especially environmental education (EE). Environmental education is an essential part of every pupil's learning. It helps to encourage awareness about the environment, leading to informed concern for active participation in resolving environmental problems (Sonowal, 2009).

1.7.0 ENVIRONMENTAL EDUCATION:

Environmental education (EE) refers to organized efforts to teach how natural environments function, and particularly, how human beings can manage behavior and ecosystems to live sustainably. It is a multi-disciplinary field integrating disciplines such as biology, chemistry, physics, ecology, earth science, atmospheric science, mathematics, and geography. The United Nations Educational, Scientific and Cultural Organization (UNESCO) states that EE is vital in imparting an inherent respect for nature amongst society and in enhancing public environmental awareness.UNESCO emphasizes the role of EE in safeguarding future global developments of societal quality of life (QOL), through the protection of the environment, eradication of poverty, minimization of inequalities and insurance of sustainable development (UNESCO, 2014a). The term often implies education within the school system, from primary to post-secondary. However, it sometimes includes all efforts to educate the public and other audiences, including

print materials, websites, media campaigns, etc.. There are also ways that environmental education is taught outside the traditional classroom. Aquariums, zoos, parks, and nature centers all have ways of teaching the public about the environment.

1.8.0 SECONDARY SCHOOL EDUCATION:

As per D.K. Illustrated oxford dictionary – (of education; a school etc.) for those who have had primary education usually from 11 to 18 years. Encyclopedic dictionary and directory of education defined (Secondary Education) as the second stage in the system of public, education, usually being with 6 and ending in class 10 of the high school.

1.9.0 BIOGEOCHEMICAL CYCLES:

they are pathways for the transport and transformation of matter within four categorical areas that make up planet Earth (biosphere, hydrosphere, lithosphere, and the atmosphere). Biogeochemical cycles are components of the broader cycle that govern the functioning of planet Earth. The Earth is a system open to electromagnetic biogeochemical cycles. Radiation from the sun and outer space, but is a virtually closed system with regard to matter. This means that the planet has minimal flux of matter, other than meteorite collisions and minor amounts of intergalactic particle trapping (or loss) by the upper atmosphere. Therefore, matter that Earth contained from the time of its birth is transformed and circulated geographically. This is in line with the law of conservation of matter which states that matter cannot be created nor destroyed but can be transformed including the transformation between matter and energy.

The transfer of matter involves biological, geological and chemical processes; hence the name biogeochemical cycles derives. Biogeochemical cycles may also be referred to as cycles of nature because they link together all organisms and abiotic features on earth (Figure 1). Matter is continually recycled among living and abiotic elements on earth. Biogeochemical cycles facilitate the transfer of matter from one form to another and from one location to another on planet earth. Additionally, biogeochemical cycles are sometimes called nutrient cycles, because they involve the transfer of compounds that provide nutritional support to living organisms.

Pathways of biogeochemical cycles: Parts that comprise planet earth have been categorized into four spheres (regions). One is the sphere which has life and it is called the biosphere (it is the region occupied by living organisms such as plants, animals, fungi) and the other three spheres are largely devoid of life, they include; lithosphere (region occupied by soil, land and the earth crust), atmosphere (air and space) and hydrosphere (areas covered by water such as rivers, lakes and oceans). However, where the biosphere overlaps the lithosphere, atmosphere or hydrosphere, there is a zone occupied by living organism.

The importance of biogeochemical cycles: Biogeochemical cycles serve a variety of functions at ecosystem level and in ensuring survival of various organisms including humans. Below are some of the importances of biogeochemical cycles.

Biogeochemical cycles enable the transformation of matter from one form to another. This transformation enables the utilization of matter in a form specific to particular organisms. For example humans utilize water in liquid form. Through the hydrological cycle, water vapour is condensed to liquid and ice converted to liquid water. Nitrogen, despite its abundance in the atmosphere it's often the most limiting nutrient for plant growth. This problem occurs because most plants can only take up nitrogen in two solid forms: ammonium ion (NH_4^+) and the ion nitrate (NO_3^-).

Therefore, biogeochemical cycles enable the provision of elements to organisms in utilizable forms.

Biogeochemical cycles enable the transfer of molecules from one locality to another. Some elements such as nitrogen a re highly concentrated in the atmosphere, but some of the atmospheric nitrogen is transferred to soil through the nitrogen cycle (which is a biogeochemical cycle).

Biogeochemical cycles facilitate the storage of elements. Elements carried through the biogeochemical cycles are stored in their natural reservoirs, and are released to organisms in small consumable amounts. For example through the nitrogen cycle and with the help of the nitrogen fixing bacteria, green plants are able to utilize nitrogen in bits though it is abundant in the atmosphere.

Biogeochemical cycles assists in functioning of ecosystems. An ecosystem is a system that properly functions in a state of equilibrium, and whenever any imbalances occur, the ecosystem through the biogeochemical cycles restores to the equilibrium state; this may take a few days or many years. The adjustment is such that the disturbing factor is eliminated.

Biogeochemical cycles link living organisms with living organisms, living organisms with the non living organisms and nonliving organisms with non living organism. This is because all organisms depend on one another and most especially, the biotic (living component) and a biotic component of the ecosystem are linked by flow on nutrients engineered by the biogeochemical cycles.

Biogeochemical cycles regulate the flow of substances. Since the biogeochemical cycles pass through different spheres, the flow of elements is regulated because each sphere has a particular medium and the rate at which elements flow is determined by the viscosity and density of the medium. Therefore elements in the biogeochemical cycles flow at differing rates within the cycle and this regulates the flow of the elements in those cycles

1.9.1 OXYGEN CYCLE:
Oxygen is life supporting elements it when binds hemoglobin it helps to survive an individual. Oxygen is normally used as respiration in all living things on the earth. Both Oxygen and Carbon

Dioxide are important elements of earth. There should be maintenance in both of these elements in living organism. Figure 1.1 oxygen cycle.
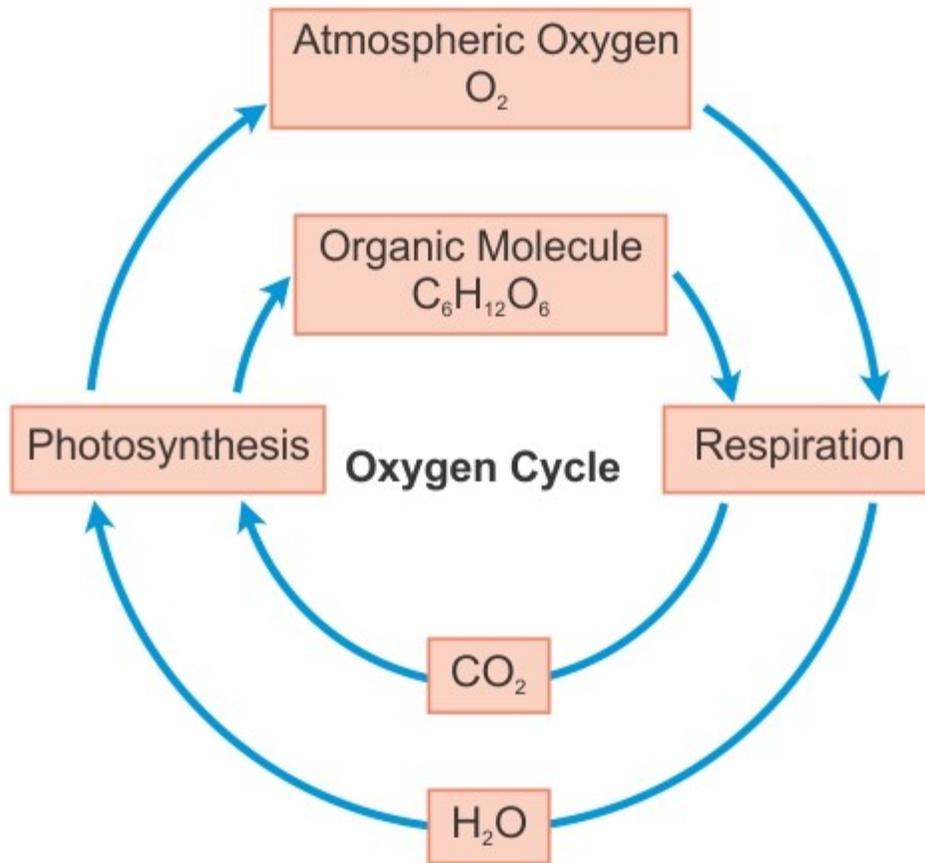
Importance of oxygen cycle:

As we all know, oxygen is one of the most essential components of the earth's atmosphere. It is mainly required for Breathing, Combustion, Supports aquatic life, Decomposition of organic waste. The oxygen cycle is mainly involved in maintain the level of oxygen in atmosphere in this both oxygen and carbon cycle occurs independently and are inter connected to each other.

1.9.2 CARBON CYCLE:
Carbon cycle is the process where carbon compounds are interchanged among the biosphere, geosphere, pedosphere. Hydrosphere and atmosphere of the earth. Figure 1.2 carbon cycle

The Carbon Cycle
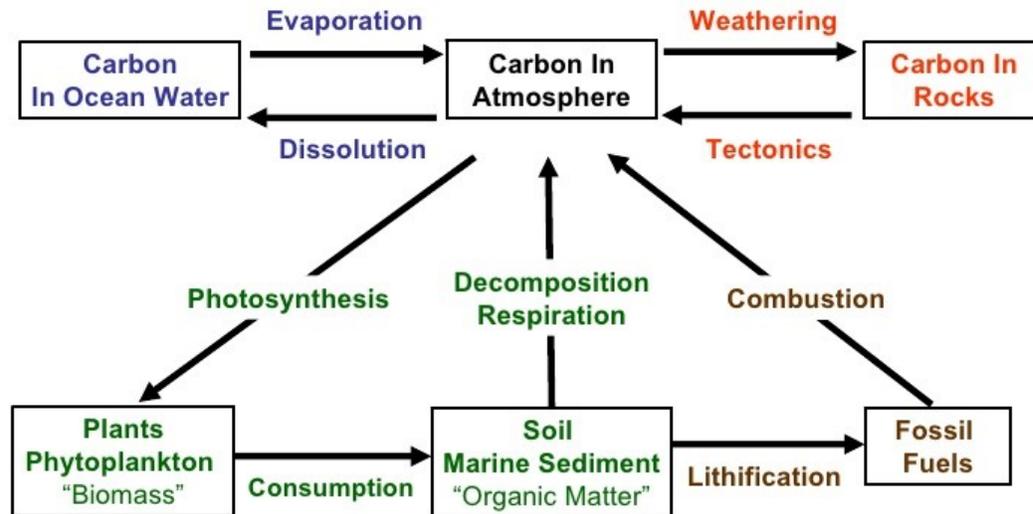
Boxes are carbon sinks   Arrows are carbon fluxes

Importance of carbon cycle:

Even though carbon dioxide is found in small traces in the atmosphere, it plays a vital role in balancing the energy and traps the long wave radiations from the sun. Therefore, it acts like a blanket over the planet. If the carbon cycle is disturbed it will result in serious consequences such as climatic changes and global warming. Carbon is an integral component of every life form on earth. From proteins and lipids to even our DNA furthermore, all known life on earth is based on carbon. Hence the carbon cycle along with the nitrogen cycle and oxygen cycle plays a vital role in the existence of life on earth.

1.9.3 NITROGEN CYCLE:

Nitrogen cycle is a biogeochemical process which transforms the inert nitrogen present in the atmosphere to a more usable form for living organisms. Furthermore, nitrogen is a key nutrient element for plants. However, the abundant nitrogen in the atmosphere cannot be used directly by plants or animals.
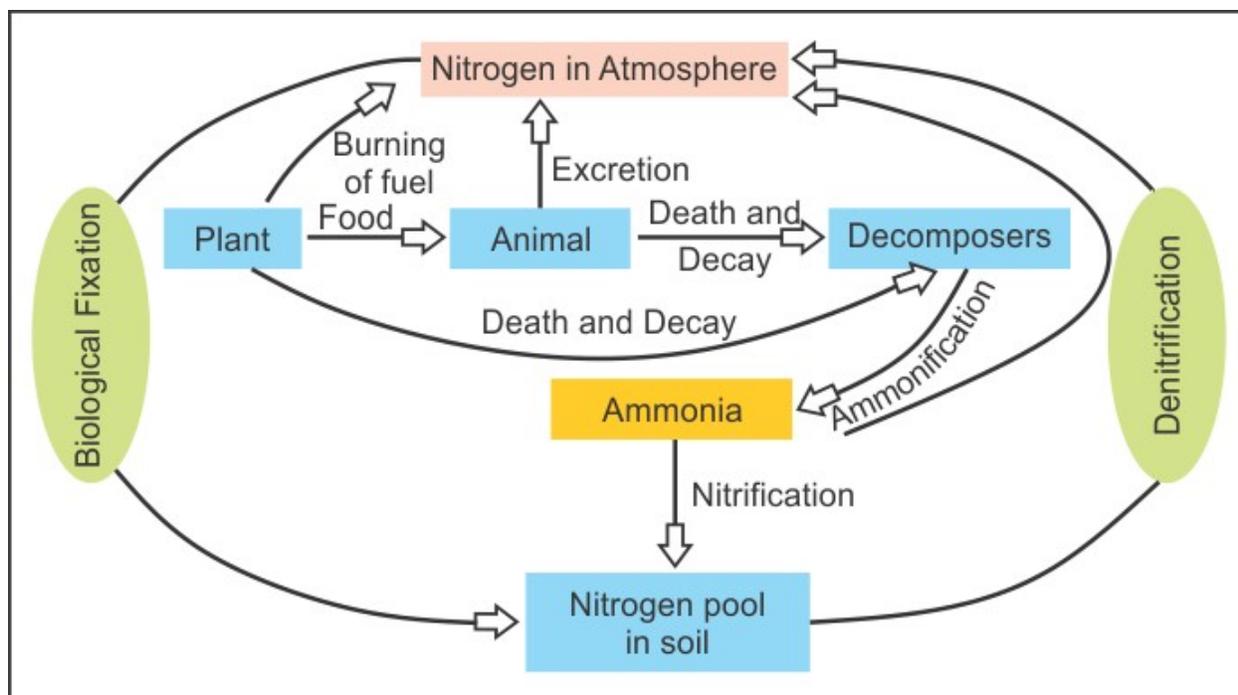
Importance of nitrogen cycle:
- Helps plants to synthesis chlorophyll from the nitrogen compounds.
- Helps in converting inert nitrogen gas into a usable form for the plants through the biochemical process.
- In the process of ammonificaton, the bacteria help in decomposing the animal and plant matter, which indirectly helps to clean up the environment.
- Nitrates and nitrites are released into the soil, which helps in enriching the soil with necessary nutrients required for cultivation.
- Nitrogen is an integral component of the cell, and it forms many crucial compounds and important bimolecular.

1.10 AWARENESS ABOUT ENVIRONMENTAL PROTECTION:

In the past two decades, environment has attracted the attention of decision makers, scientists and even laymen in many parts of the world. They are becoming increasingly conscious of issues such as famines, droughts, floods, scarcity of fuel, firewood and fodder, pollution of air and water, problems of hazardous chemicals and radiation, depletion of natural resources, extinction of wildlife and dangers to flora and fauna. People are now aware of the need to protect the natural environmental resources of air, water, soil and plant life that constitute the natural capital on which man depends.

The environmental issues are important because the absence of their solutions is more horrible. Unless environmental issues are not solved or not taken care of the coming generations may find earth worth not living. The need of the planet and the needs of the person have become one

There is no denying the fact that environment has to be protected and conserved so to make future life possible. Indeed, man's needs are increasing and accordingly the environment is also being altered, indeed, nature's capacity is too accommodating and too regenerative yet there is a limit to nature's capacity, especially when pressure of exploding population and technology keep mounting. What is required is the sustenance, conservation and improvement of the changing and fragile environment

The Concept of Sustainable Development;

The world commission on environment and development (the Brundtland commission) submitted its report entitled "Our common future' in 1987. This report highlighted and popularized the concept of 'sustainable development'. Sustainable development has been defined on meeting the needs of the present generation without compromising the need of future generations. All developmental activities involve some amount of environmental degradation. What is required is to take into account the damage to environment as a result of development, and strike a balance between development and environmental protection. The aim should be to achieve sustainable levels of people's welfare and development. The primary concern is how many people can ultimately be supported by environment and at what level of quality of life

The mainstream greens scholars like Carr, Brown, Dala, Schumacher. Does not make sense and others, all lay stress on "sustainability" of environment together with development. The emphasis of the mainstream green' are not on pollution, but on (1) energy and its resource may be renewed, and be kept renewing, (2) the waste be changed into raw-material, raw-material into waste, waste into raw- material: recycling of waste into raw-material; (3) gross national product and its growth targets need not be sought, but what should be sought is the satisfaction of real human needs'. The greens say that growth means cancer, a cancer that threatens to spread worldwide, and destroy all life. They accept industry if it is on small scale and is for purpose of self-sufficiency. They advocate extensive decentralization.

The concept of sustainable development is more about environment and less about development; more about stability and less about change; more about restricting one's wants and less about the continuing material development more about the non-exploitative attitude towards environment and less about harnessing it; more about small communities and less about the larger ones. It is not a concept of development with environment, but is environment without growth.

Indeed, ecological degradation should stop. But why should the pace of development stop? A disciplined uses of environmental benefits go a long way for all round development. Scholars and activists assert that environmental degradation can be controlled and reversed only by ensuring that the parties causing the damage should be made accountable for their action and that they should participate in improving environmental conditions. What is needed is a set of norms, which bring the demands of development and the compulsion of environment closer to each other.

National and International Efforts:

In India, the environmental awareness gained importance since 1970s after the UN sponsored conference on environment in Stockholm (1972). Indian government took many environment

friendly activities. Ministry of environment and forest was established and laws were enacted on environment protection in 1986.

The objective of India's National Environment policy, here, are worth stating.

1. Conserve and develop safe, healthy, productive, and aesthetically satisfying environment ;
2. Upgrade, develop and manage rural and urban settlement to enhance the quality of life
3. Plan development on sound ecological principles with environmental impact assessment and incorporating appropriate environmental safeguards ;
4. Promote environmental safety-technologies, recycling of resources and utilization of wastes ;
5. Conserve the biotic diversity in the country by creating nature reserves and sanctuaries for specific habitats such as mountains, rain forests, pastures, deserts, wet lands, lakes, beaches, mangroves, estuaries, lagoons and island ;
6. Safeguard the environment within the national maritime Exclusive Economic Zone ;
7. Evolve environmental norms and establish effective mechanism for monitoring surveillance and collection and dissemination of information
8. Preserve science landscapes, as well as historic and cultural monuments and their environ
9. Promote environmental education at all level and create public awareness
10. Encourage research in environmental science and technological and social investigation to conserve and improve the environment and
11. Develop adequate manpower within the country, of ecologists, environmental scientists, planners and managers of the highest quality and recognize their work as an important component of national development.

National and International Commitment to The Protection of Environment:
The growing awareness about environmental protection has resulted in new measures across the world. The late Prime minister Mrs. Indira Gandhi was the only Head of Government, attending the 1972 Stockholm conference, which was called the "U.N. Conference on Human environment". The Rio Conference 20 years later were called the "U.N. Conference on Environment and Development". It was Mrs. Gandhi who first pointed out that poverty was the greatest polluter and unless it was eliminated through national and international efforts it was futile to talk about protecting the planet from environmental disaster. UNDP, the World Bank and other institutions of the U.N. system are now advocating the elimination of poverty as the central task in sustainable development. Indeed environmental and development polices are seen as complementing each other. The conflicted between the requirement of long-term environmental interests and the immediate compulsions of development is certainly to be resolved. But any world order cannot be sustainable if three-fourths of its population continues to live in poverty. Environmental rights and developmental rights together constitute the democratic and human rights of all the people of the world.

The Montreal convention and the conventions on climate change; bio-diversity and forest adopted at Rio are important landmarks in the world movement for sustainable development and

environmental protection. India has accepted these conventions and is taking systematic measures to implement them. An environmental action programme funded by U.N.D.P.is under implementation. There are 31 schemes for industrial pollution control approved by the World Bank, involving of US. $ 105 million. On the anvil are common effluent plants for small industries located in a cluster, the big plants being looked after individually. Seventeen grossly polluting industries have been identified for environment control within a time schedule. For certain categories of industries, prior environment clearance is compulsory before they can be set up. In Regard to transport pollution apart from conversation measures, population free engines are being designed, some of which have already been introduced for two-wheelers, three-wheelers and some of the popular cars. A National Forestry Plan is in progress. Environmental Brigades, Afforestation Brigades and Ecological task Force have been organized by Non-government organizations (NGOs.) India's wild life conservation projects have met with remarkable success. India has a protected network of 75 national parks and 421 wild life sanctuaries. The Tiger project has been a great success. India also has an elaborate laws relating to the prevention of pollution of water, soil and air and a system of environmental audit of most industrial projects. While this is voluntary for most countries, India has a mandatory rule in this regard. India is also engaged in serious and systematic efforts to develop alternative and renewable sources of energy like solar, wind and wave energy which are environment friendly. Emphasis is laid on solar energy on which some significant technological progress has been made. India is taking all these measures partially with international assistance.

Some Measures taken by Indian Government to Check Environmental Pollution:
1. Environmental Courts: Special courts are being set up to ensure speedy justice of the poor against factories that pollute the Environment.
2. Environment Friendly Products: The government is setting stringent standards for all products in the market. Those, which meet these standards of production and performance, will be given the label of excellence like the ISI mark.
3. Unleading Of Petrol: Refineries are being persuaded to make their petrol lead free. Indian petrol has the highest lead content, which creates major pollution through automobiles.
4. Ban On Harmful Pesticides: Eight chemical pesticides, of which DDT, BHC, Aldrin and Malathion are the main culprits have been isolated. There are now plans to replace them with safe biopesticides.
5. National Waste Management Council: The main task is to convert 40 million tons of flyash that lie as a mountain near thermal power plants into bricks, city garbage into energy and sewage into fertilizer.
6. Public Liability Insurance: This makes it mandatory for all companies to take out a public liability insurance to be paid in 48 hour
7. Pollution By Motor Vehicles: Anti-pollution measures against motor vehicles are being strictly enforced. Vehicles not adhering to the standards prescribed are fined heavily and may even be asked to be off the road

8. Hotel near Sea Shore: Action has been taken against a large number of hotels which encroach beaches in flagrant violation of laws.
9. National River Action Plan: The proposal is to set up a National river authority which will plan policy for water use and waste management at the national level.
10. Solar Energy Commission: Since the energy sector is the major polluter, the idea is to create decentralized energy at the village level, instead of multiplying the mainstream producer.
11. No Smoking In Public Places: A ban is proposed on smoking in public places. The Delhi government has taken a lead in this direction.

RESEACH QUESTIONS

1. Why concept of biogeochemical cycle is needed to explain to students of 9th class?

2. How environmental pollution awareness can be connected with Bio-geo chemical cycle?

3. What will happen if biogeochemical cycles are disturbed?

1.11 STATEMENT OF THE PROBLEM
Developing environment pollution awareness among students of class 9th through bio-geochemical cycle.

1.12 OBJECTIVES OF THE STUDY

1. To develop environmental pollution awareness among class 9th students.
2. To study the effectiveness of environmental pollution through biogeochemical cycle.
3. To understand biogeochemical cycles and impact of its disturbances.

1.13 HYPOTHESIS
There will be no significant difference in the pre test and post test mean score of the students of 9th class on environmental awareness and bio-geo chemical cycle.

1.14 OPERATIONAL DEFINITION OF TERMS

1. **Pollution:** it is generally defined as the presence of any substance whose nature, location or quantity produce has desirable environmental effect or pollution is the impairment of the quality of some portion of the environment by the addition of harmful impurities.

2. **Awareness:** awareness is the ability to directly know and per cave, to feel or to be cognizant of events. It is states of being conscious of something.

3. **Biogeochemical cycle**: it the cyclic pathways through which chemical elements like Hydrogen, Carbon, Oxygen, Nitrogen etc travel from the environment into the organisms and from the organisms into the environment regularly and continuously are called bio-geo chemical cycle. Bio includes the organisms; geo includes the soil, mocks, water etc, which continuously go round in the cycle in surrounding. The main purpose of it is moving from biotic to abiotic component and from abiotic to biotic component in atmosphere.

1.15 DELIMITATIONS OF THE STUDY

1. The study is delimited to class 9th students of English medium of Gujarat state.

2. The study is also delimited to Oxygen Cycle, Carbon Cycle and Nitrogen Cycle.

CHAPTER -II
REVIEW OF RELATED LITERATURE

CHAPTER -II

REVIEW OF RELATED LITERATURE

2.0 INTRODUCTION

Review of related literature gives a clear idea to the researcher about the researchers that have been conducted in his/ her field of research. In the present study researcher has carried out research in two categories. The first category emphasis on the environmental awareness and the second category on biogeochemical cycles. The researcher has made an attempt to understand the objectives, sample and sampling techniques, research design, data collection tools, data analysis techniques and the findings of the related studies. On the basis of the analysis of the review of related literature, the implication of the related literature is developed for the present study.

2.1.0 REVIEW OF RELATED TO ENVIRONMENT POLLUTION AWARNESS.

➤ **Karpagam, P** (2014) conducted research on "**Influence of naturalistic intelligence and environmental awareness on teaching science among school teachers in tirunelveli district**" . Objectives of the study To find the level of naturalistic intelligence among school teachers. ii. To find the level of environmental awareness among school teachers. iii. To find the level of teaching science among school teachers. iv. To find whether there is any significant influence of naturalistic intelligence and environmental awareness on teaching science of school teacher's v. To find whether there is any significant relationship between naturalistic intelligence and teaching science of school teachers. vi. To find whether there is any significant relationship between environmental awareness and teaching science of school teachers. vii. To find whether there is any significant difference in naturalistic the investigator selected the survey method for conducting the study. The population for present study consisted of school teachers from thirty different high and higher secondary schools in Tirunelveli educational district in Tamil Nadu. they found The environmental awareness level of school teachers and its dimensions, namely personal cleanliness, knowledge, skills and Environmental values are average (57.8%, 53%, 49.2%, 64%and 71%).Among the average values, the awareness level of environmental values is high (64.2%) and skills is low (49.2%).The research gave suggestion about level of naturalistic intelligence and environmental awareness of the teachers and the importance of environmental knowledge of teachers than students. For this the investigator realized that by giving more facilities or instruction through different teaching methods get the opportunity for teaching science in a better way.

➤ **Vanlalhlani** (2013) conducted research on "**A study of environmental awareness amongst higher secondary school students in aizawl lunglei districts of Mizoram**". Objectives of the study to develop a test to find out the level of environmental awareness amongst the higher secondary school students in Aizawl and Lunglei districts of Mizoram.To study the

level of environmental awareness amongst the higher secondary school students in Aizawl and Lunglei districts of Mizoram. To compare the level of environmental awareness of the higher secondary school students in Aizawl and Lunglei districts of Mizoram based on gender, type of school, areas and streams. To compare the level of environmental awareness between the higher secondary school students in Aizawl district and Lunglei districts of Mizoram. The population of the study comprised the students of class XI and class XII of the higher secondary schools studying in different streams like arts, science and commerce in Aizawl and Lunglei district of Mizoram. This study therefore has helped us in realizing the environmental awareness level of the higher secondary schools students in Aizawl and Lunglei district of Mizoram. It is anticipated that the outcome of this research work will be useful in formulating a curriculum that encompasses environmental issues, and in the planning of programmes to promote an awareness and understanding of the environment amongst the students in Mizoram.

➢ **Nagorao (1987)** do research on "Effect of pollution due to an of a few fresh water animals" here he mention water pollution in his studies its causes and impact on ecosystem. All water samples were collected from river and sampling and testing was conducted under laboratory. Lab expertise performs the entire test regarding water pollution.

➢ **Jadav** (2000), studies on "Environmental Pollution in vicinity of Aurangabad" soil pollution and water pollution were there area. They collected 12 samples from different places and conducted BOD and COD test.

➢ **Chaudhari** (2004) proposed his dissertation on "Environmental knowledge and Environmental attitude of students of secondary schools of Vadodara city". The purpose of her study is to study the environment knowledge and environment attitude among students. She also wants to find out the relationship between environmental knowledge and environmental attitude. She used survey method for her study and "cluster sampling at last her study she forward that environmental awareness in students is due to science subject as science as a subject is dominant in which 2 chapter of environmental science are there where the students get awareness of environment protection.

➢ **Shobeiri, et al** (Oct 2006) conducted study on "A comparative study on environmental awareness among secondary school students in Iran and India. The study investigated secondary school students' environmental awareness in India and Iran. Nine hundred and ninety one students were selected through the stratified random sampling technique from 103 secondary schools of Mysore city (India) and Tehran city (Iran). Subjects consisted from 476 boys and 515 girls. They were assessed using the environments awareness ability measure (EAAM). Results indicate that there are significant differences between Indian and Iranian students in their level of environmental awareness. Also there are significant differences between them in environmental awareness across and within two groups with regard to their genders. Also type of school management (Government and private) is a factor, which can affect students' environmental awareness in both countries.

- **Ghosh** (March 14) conducted his study on "environmental awareness among secondary school students of Golaghat district in the state of Assam and their attitude towards environmental education". The present study attempts to study the level of environmental awareness and attitudes towards environmental education among secondary school students of Golaghat district in the state of Assam. The sample consisted of 200 students which includes 100 boys and 100 girls. The descriptive survey method was employed for the present study. Environmental awareness, attitude and socio-economic scale was developed and standardized for the present study. The data was statistically analyzed by using "z" test and karl pearson's coefficient of correlation ("r"). Environmental awareness and attitude towards environmental education among the secondary school male and female students was found not significant; but in case of rural and urban student the attitude towards environmental education was found significant. The relationship between environmental awareness and attitudes towards environmental education among the students was found strong and positive.

- **Geetha Gopinath** (June 14) conducted his study on "A study on the environmental awareness among secondary school students in a district of Kerala state" the present investigation reveals the level of environmental awareness of secondary school students in a district of Kerala state based on gender locale of study and medium of instruction. Random sampling was used to select 158 secondary school students from Pathnamthitta district, Kerala state. Normative survey method was used for the present investigation. Environmental awareness scale constructed and validated by the investigator was used. Calculation of means and standard deviations and test of significance. Total scores of environmental awareness stood at a low level (<50). Girls' environmental awareness was greater than boys, urban students' awareness greater than rural students and Malayalam medium students' awareness greater than English medium students. Environmental education, a process for increasing environmental knowledge and awareness is essential for the future of this world. This study evaluates awareness about the environment among students to remedy lacunae in existing situation.

- **Ahmet et al** (2014) conducted study on "Environmental awareness level of secondary school students" case study in balikesir (Turkey) in this study, secondary school students' awareness of environmental issues and problems and the level of their active participation in environmental activites have been identified, and the effects of some factors as family school and media on their environmental awareness and active participation have been investigated. The study was carried out in Balikesir city centre by conducting a survey on senior students consisting of 6 classes from three secondary schools which have different demographic and socio-economic levels. The results of the study showed a high level of environmental awareness among participant students. However, it is understood that environmental disclosures made in schools are insufficient and the participation level of students to environmental activities is low. Students rather gain experiences in the field of environment from mass media (i.e. audio, printed and visual media). It is revealed that female students

have higher level of environmental awareness and active participation level. In addition, when family income and family education level increases, environmental awareness and active participation level of students also increases.

- **Bachhar et al** (Aug 2016) conducted study on "Awareness of environmental pollution among secondary level learners in Nadia district of the state of West Bengal researchers have taken the present paper aimed at measuring the awareness of secondary level learner towards environmental pollution in Nadia district, West Bengal, India. A survey of 300 sample from rural and urban (rural-150 and urban-150) was selected for the study. One principle variable- 'awareness towards environmental pollution' was considered. Five null hypotheses were framed for the study. One questionnaire which consists of 30 multiple choice type questions of five different dimension of pollution indicator was framed for measuring awareness of environmental pollution among secondary students. Test-retest method was used for estimated the reliability of the tool. Mean and sd as descriptive statistics, and "t" test as inferential statistics were employed to find out the significance difference among the gender toward environmental pollution. Finally they found significant difference from two null hypotheses. And the awareness level scores were significantly higher in case of urban male and female students.

- **Singh** (Dec 2016) conducted study on "Environmental awareness level amongst secondary school students in Kangra district base on different variables. The purpose of this survey is to identify the level of environmental awareness among secondary school students. Questionnaire technique is used to collect the data. The collected data are tabulated and computed applying simple statistical tools. The results show that the level of environmental awareness among students is low. No significance difference is found with respect to age and settlement in the environmental awareness level of the students. On the other hand significance difference was found the environmental awareness of secondary school students belonging to different age group.

- **Sahu** (2008), conducted study on "A study of awareness of environmental pollution among secondary school students of west Orissa". Objective of his study is to ascertain the extent of awareness of environmental pollution among secondary school students. The impact of environmental education curriculum on secondary school students. Descriptive survey method has followed. Major findings: The environmental pollution awareness score of urban area students is higher than that of rural students. The impact of special environmental education on the students of special group is significant. The students are aware of environmental hazards but their low score suggest that their knowledge base on environmental pollution is still incomplete. This might be due to lack of proper understanding of cause and effect relationship of pollutants and pollution hazards.

- **Medhi** (2018) conducted study on "Environmental awareness among high school students of Kamrup district". The present study is an attempt to examine the environmental awareness among high school students of Guwahati City of Kamrup district in relation to gender and type of school. Descriptive survey method and simple random sampling technique was used

for the present study. The sample consisted of 100 high school students out of which 50 were boys and 50 were girls. The investigator has used self structured standardized data gathering tools for collecting the data. To test the hypotheses, appropriate statistical technique has been used. The self structured questionnaire was used as a tool. Findings of the study are that there exists no significant difference in environmental awareness of boys and girls high school students. It was further found that there exists significant difference in environmental awareness of government and private high school students.ss

- **Bordhan** (2017) conducted study on "A study on the environmental awareness among secondary school students in a district of Assam. The investigation was based on gender, local of study and medium of instruction. Random sampling was used to select 158 secondary school students from kamrup (Metro) district, Assam. Normative survey method was used.

- **Tron** (2013) conducted study on "A study on environmental awareness among secondary school students of Cherapunjee town east khasi hills district Meghalaya." Objective his study was to study the environmental awareness among secondary school student in context with environment, air pollution, water pollution, soil pollution and industrial pollution. To find out awareness in students on the depletion of natural resources. To aware students on method or conservation or natural resources. To find students to participation in environmental awareness programme. In his study descriptive method was used. Findings in this study finding ware according to objective in which researcher had mentioned every activity and he found that both teacher and students were participating in it.

- **Yadav** (2013) conducted study on "A study of environmental awareness and attitude of pre service and in service elementary and secondary school teachers". Found that the teachers who participated in present study have responded honestly to the questions in the two tests on environmental awareness and attitude towards environment. The data set generated herein is very robust and unbiased as opinion of the pre-service and in-service elementary and secondary school teachers about environmental awareness as well as attitude towards environment follows a normal frequency distribution pattern. Mean and median scores of the environmental awareness as well as attitude towards environment are very close to each other rather same in some cases. The level of teaching i.e. elementary or secondary as well as status of teacher i.e. teacher trainee/pre-service or in-service has least effect on their environmental awareness levels. All teachers irrespective of their education, gender, year of teaching experience has got very high level of environmental awareness with very limited cases of average environmental awareness level. However, teacher training and teaching experience seems to increase the absolute scores of individuals on environmental awareness, reflecting a positive impact of these two parameters on environmental awareness levels. All teachers have neutral to slightly moderately favorable attitude towards environment. Teachers of all categories and status are strongly lacking on their pro-attitude towards environment. The high levels of environmental awareness among all category teachers have not transformed into their behavior changes. Therefore, the yield in the attitude of children

towards environment is less likely to occur at the desired pace. To study and compare the pre-service elementary and secondary school teachers on their environmental awareness. To study and compare the in-service elementary and secondary school teachers on their environmental awareness. To study and compare the pre-service and in-service elementary school teachers on their environmental awareness. To study and compare the pre-service and in-service secondary school teachers on their environmental awareness. To study and compare the pre-service elementary and secondary school teachers on their attitude towards environment. 2.2 To study and compare the in-service elementary and secondary school teachers on their attitude towards environment. 2.3 To study and compare the pre-service and in-service elementary school teachers on their attitude towards environment. 2.4 To study and compare the pre-service and in-service secondary school teachers on their attitude towards environment. The descriptive statistical tools such as mean, mode, median, standard deviation, coefficient of variance, skewness, box and whisker plot, frequency distribution and two tailed t test at 95% and 99% percent confidence limit were used for the data analysis and testing of hypothesis to meet the objectives.

- **Patel** (1993) conducted study on "An investigation into the environmental awareness and its enhancement in the primary school teachers". Objectives of the study to find cut and determine the various aspects of the environmental studies prescribed at primary school level. To study the existing amount of environmental awareness among the primary school teachers. To develop and implement a program to enhance the environmental awareness among the primary school teachers. To study the effect of environmental awareness program in relation to the Demographic variables viz., Area, Caste and Sex. To derive some recommendations for imparting better environmental education at primary school level. The main purpose of the study is to enhance the environmental awareness of the primary school teachers through specific treatment program and to study its impact on their pre-acquired awareness about the environment in relation to certain demographic independent variables viz. Area, Caste and Sex.

- **Ramiah** (2006) conducted study on "Environmental awareness and attitude towards environmental education among the undergraduate and post graduate students in Arunachal Pradesh". Objectives of the study to assess and compare the environmental awareness and attitude among the UG and PG students of Arunachal Pradesh. To study the influence of sex, academic achievement race and their interactions on the environmental awareness and attitude towards environment education of UG and PG students of Arunachal Pradesh. . To study the influence of discipline and their interactions on environmental awareness and attitude towards environment education of the UG and PG students of Arunachal Pradesh. . To study the influence of Socio Economic Status, Settlement, and their interactions on environmental awareness and attitude towards environment education of the UG and PG students of Arunachal Pradesh. The researcher has adopted the Normative Survey Method of educational research. The details are as under: The researcher developed and used the Environmental Education Avk^areness Test, consisting of 30 items for assessing the

Environment and environmental education awareness among the undergraduate and postgraduate students of Arunachal Pradesh. The environmental education awareness scores of 608 students were tabulated. The maximum marks of the test were 150 It means the environmental education awareness mean score of the test may range from zero (0.0) to 150 marks. The researcher developed and used Attitude Scale to measure the attitude of the undergraduate and postgraduate students towards environmental education The attitude scale contained 30 items relating to environment and environmental education. The environmental awareness scores of 608 students were used for computing the environmental education awareness mean scores of students The maximum marks of this test were 150. It means the environmental education awareness mean scores of the test may range from zero (0 0) to 150 marks and the mean scores of this test are 88.32. But the overall mean scores of 608 students is almost equal to the mean scores of the test. It means the students are having an average amount of environment and environmental education awareness. The researcher developed and used attitude scale to measure attitude of students towards population education. The attitude scale contained 30 items relating to environment and environmental education. As per the weightage to responses against each statement, the minimum and maximum attitude scx)re of any student comes out to be zero (30x0 = 0) and 150 (30x5 = 150) respectively. The mean scores of under graduate students came out to be 127.27 whereas the mean scores of this attitude scale is 123.73. It shows that the Undergraduate and post Graduate students has quite favourable attitude towards environment and environmental education.

➢ **Gupta** (2005) conducted study on "ENVIRONMENTAL AWARENESS AMONG ADOLESCENT GIRLS IN RELATION TO THEIR SOCIO ECONOMIC STATUS INTELLIGENCE RELIGIOSITY AND VICINITY" objective of the study to study the effect of socio-economic status on environmental awareness. To study the effect of intelligence on environmental awareness. To study the effect of religiosity on environmental awareness. To study the effect of age on environmental awareness. . To study the effect of vicinity on environmental awareness. To ascertain the zero order relationship between environmental awareness and predictive variables viz. SES, Intelligence, Religiosity, Vicinity and Age. To study the joint contributory role of predictive variables in determining the environmental awareness. To study the relative contributory role of the predictive variables in determining the environmental awareness. To predict the environmental awareness of the adolescent girls on the basis of the predictive variables viz. SES, Intelligence, Religiosity, Vicinity and Age. All the independent variables under study have the significant effect on environmental awareness of adolescent girls. SES, intelligence, religiosity and age have the moderate & positive relationship while vicinity has the low positive relationship with environmental awareness of adolescent girls. Significant multiple relationship exists between environmental awareness and the predictive variables viz SES, intelligence, religiosity, age and vicinity.Environmental awareness of adolescent girls can be determined to a certain extent by the variables under study. About 67% variance in the environmental awareness of the adolescent girls could be accounted for by these predictive

variables. SES, Intelligence and age have come out as potent predictors of environmental awareness and in comparison to these variables; religiosity is a weak predictor of environmental awareness. Vicinity also has significant effect on environmental awareness of adolescent girls but has come out as a weak predictor of environmental awareness.

➢ **Latha K** (2015) conducted study on "Environmental Awareness and Attitude among Secondary School Studies A Study". To assess the environmental awareness of secondary school students. To analyze the environmental attitude of secondary school students. To investigate the relationship between environmental awareness and environmental attitude of secondary school students. Environment is a global concept today. If our students are to meet the challenges of the future, they deserve to be well informed and educated about the environment they will inherit (Amarbir Singh, 2011). The same tone was expressed UNESCO–UNEP 1991 document that Environmental education is crucial to prepare environmentally literate students who, asfuture citizens, would play an active role in protecting the environment through making informed decisions and taking environmental friendly actions. Therefore it can be concluded that boys and girls secondary school students have equal level of environmental awareness. There is a need to teach the environmental science subject in such a way that the environmental awareness is created among boys and girls of Secondary Schools. The present investigation revealed that there is no significant difference among different groups of parents (Fathers) in their environmental awareness as well as in their environmental attitude with reference to their educational qualification. The same trend was demonstrated even in the case of mothers' in question.

➢ **Saba** (2002) conducted study on "Environmental awareness among senior secondary school children in relation to their gender, academic stream intelligence and socio_economic background".objective of the study To develop an Environmental Awareness Assessment Scale (EAAS) for measuring Environmental Awareness of students studying in XI and XII standards (Senior Secondary School Level) To study Environmental Awareness among Senior Secondary Students and to establish relationship, if any, between Environmental Awareness and Gender. To establish a relationship between Environmental Awareness and Intelligence of Senior Secondary School Children. To study the influence of Socio-economic status of pupils on their Environmental Awareness. To study the effect of gender on Environmental Awareness of Senior Secondary Children. The Commerce Group students on the other hand were next to the Science Group regarding Environmental Awareness and they differed from Social Science students with a higher degree of awareness. The students of Arts came at the third place regarding the Environmental Awareness. They didn't differ from Commerce Group students but were found to be more aware than Social Science Group. Science boys showed the highest mean value {i.e. M=122.52) and they differed in their Environmental Awareness with their counter parts in Social Science discipline.

2.2.0 REVIEW OF RELATED TO BIOGEOCHEMICAL CYCLE

➢ **P. Smith et al** (2015) conducted study on "Biogeochemical cycles and biodiversity as key drivers of ecosystem services provided by soils". In their report they found that the state-of-the-art understanding concerning the biogeochemical cycles and biodiversity in soil, and relate these to the provisioning, regulating, supporting and cultural ecosystem services which they underpin. We then outline key knowledge gaps and research challenges, before pro10 viding recommendations for management activities to support the continued delivery of ecosystem services from soils. And conclude that although there are knowledge gaps that require further research, enough is known to start improving soils globally. The main challenge is in finding ways to share knowledge with soil managers and policy-makers, so that best-practice15 management can be implemented. A key element of this knowledge sharing must be in raising awareness of the multiple ecosystem services underpinned by soils, and the natural capital they provide. The International Year of Soils in 2015 presents the perfect opportunity to begin a step-change in how we harness scientific knowledge to bring about more sustainable use of soils for a secure global society.

➢ **Christopher Lant et al** ((2016) conducted study on "Environmental Systems Simulations for Carbon, Energy, Nitrogen, Water, and Watersheds: Design Principles and Pilot Testing". In their study they found that the Next Generation Science Standards and elements of problem-based learning, four human–environment systems simulations are described in brief—carbon, energy, water, and watershed—and a fifth simulation on nitrogen is described in more depth. These science, technology, engineering, and math (STEM) education simulations illustrate design principles that make them engaging to students, such as dynamic visual environments that are controlled by the user and immediate visual feedback to user actions taken. The simulations are contextualized in real-world natural resources management challenges involving biogeochemical cycles, such as Gulf of Mexico hypoxia, which provide an opportunity to ''win the game,'' while the introduction of complexity in steps provides scaffolding. Pretest versus posttest results indicate a substantial and statistically significant improvement in learning outcomes resulting from using the nitrogen simulation, though there was no comparable pedagogical control group. Attitudinal feedback indicates rich student engagement with the nitrogen simulation.

➢ **Muhumuza(**2016) conducted study on " the article biogeochemical cycles". He says that biogeochemical has a vital role in environment in various way and gives detail descriptions on it. The forms of biogeochemical cycles and its impact on human begins and its causes and disturbances.

➢ **T. Bramryd** (1983) conducted study on "human impact on the biogeochemical cycling of carbon between territial ecosystem and atmosphere". Increased combustion of fossil fuels and an accelerated exploitation of terrestrial ecosystems have increased the atmospheric CO_2 concentration by over 20 ppm during the last decades. Replacement of virgin forests with intensively managed forests with fertilizations, earlier cuttings, etc. in boreal and temperate areas can result in a net release of CO_2 to the atmosphere of up to 123×10^6 Tg C. utilizations

of logging slash as fuel also in industrialized countries results in a decreased input of organic matter to the soil and thus decreases the pool of long term accumulated soil organic carbon. Soil probably acts as one of the most significant sinks for organic carbon in terrestrial ecosystems. Increase exploitation of peatlands may have significant effects on the carbon cycle. Burning of peat as fuel in an increasing number of countries rapidly releases the organic carbon accumulated in the peat layers. Accumulation of organic carbon in urban ecosystems may be of much more importance than has been realized before. New estimates of pools and manmade fluxes of carbon in these areas are presented. In addition to accumulation of organic carbon in the oceans, many of the processes in terrestrial ecosystems, like peat accumulation and formation of soil organic matter, act as feedback mechanisms for increased atmospheric CO_2 concentrations.

➢ **Huai chan et al** (2013) conducted study on "The impacts of climate change and human activities on biogeochemical cycles on the Qinghai-Tibetan Plateau". With a pace of about twice the observed rate of global warming, the temperature on the Qinghai-Tibetan Plateau (Earth's 'third pole') has increased by 0.2 °C per decade over the past 50 years, which results in significant permafrost thawing and glacier retreat. They suggested that warming enhanced net primary production and soil respiration, decreased methane (CH(4)) emissions from wetlands and increased CH(4) consumption of meadows, but might increase CH(4) emissions from lakes. Warming-induced permafrost thawing and glaciers melting would also result in substantial emission of old carbon dioxide (CO (2)) and CH (4). Nitrous oxide (N (2) O) emission was not stimulated by warming itself, but might be slightly enhanced by wetting. However, there are many uncertainties in such biogeochemical cycles under climate change. Human activities (e.g. grazing, land cover changes) further modified the biogeochemical cycles and amplified such uncertainties on the plateau. If the projected warming and wetting continues, the future biogeochemical cycles will be more complicated. So facing research in this field is an ongoing challenge of integrating field observations with process-based ecosystem models to predict the impacts of future climate change and human activities at various temporal and spatial scales. To reduce the uncertainties and to improve the precision of the predictions of the impacts of climate change and human activities on biogeochemical cycles, efforts should focus on conducting more field observation studies, integrating data within improved models, and developing new knowledge about coupling among carbon, nitrogen, and phosphorus biogeochemical cycles as well as about the role of microbes in these cycles.

➢ **Finzi et al** (2011) conducted study on "Research frontiers in the analysis of coupled biogeochemical cycles". The analysis of coupled biogeochemical cycles (CBCs) addresses the scientific basis for some of today's major environmental problems. Drawing from information presented at a series of sessions on CBCs held at the 2009 Annual Meeting of the Ecological Society of America and from the research community's expertise, we identify several principal research themes that justify action and investment. Critical areas for research include: coupling of major element cycles to less studied yet equally important trace

element cycles; analyzing CBCs across ecosystem boundaries; integrating experimental results into regional- and global-scale models; and expanding the analysis of human interactions with CBCs arising from human population growth, urbanization, and geo engineering. To advance the current understanding of CBCs and to address the environmental challenges of the 21st century, scientists must maintain and synthesize data from existing observational and experimental networks, develop new instrumentation networks, and adopt emerging technologies.

➢ **Galloway et al** (1976) conducted study on "biogeochemical cycles" Human activities have increased atmospheric carbon dioxide by about 40% over pre-industrial levels and more than doubled the amount of nitrogen available to ecosystems. Similar trends have been observed for phosphorus and other elements, and these changes have major consequences for biogeochemical cycles and climate change. 2. In total, land in the United States absorbs and stores an amount of carbon equivalent to about 17% of annual U.S. fossil fuel emissions. U.S. forests and associated wood products account for most of this land sink. The effect of this carbon storage is to partially offset warming from emissions of CO_2 and other greenhouse gases. 3. Altered biogeochemical cycles together with climate change increase the vulnerability of biodiversity, food security, human health, and water quality to changing climate. However, natural and managed shifts in major biogeochemical cycles can help limit rates of climate change

➢ **Dong et al** (2019) conducted study on "preface to recent research advances in biogeochemical cycle in china". They found that Microbes play an important role in many biogeochemical cycles in various terrestrial and aquatic ecosystems (Rousk and Bengtson, 2014). Studies of microbially-driven geochemical cycles emphasize the mutual interactions between organisms and their environments, on both the modern and ancient Earth. Carbon, nitrogen, sulfur, metals, and metalloids undergo biogeochemical cycling between various oxidation and coordination states, and these processes control nutrient availability and transport as well as regulate microbial population size and activity. Microbial induced dissolution, precipitation and transformation of minerals can be recorded in the form of bio-signatures, which can be used to infer past microbial activity. The study of biogeochemical cycles enriches our understanding of how the spatial and temporal distributions of nutrients and other elements have evolved through time and their environmental consequences.

➢ **Eriksson et al** (1976) conducted study on **"**Man and Biogeochemical Cycles: Impacts, Problems and Research Needs" Nitrogen phosphours and sulphur are essential elements in all living matter and are found in varying proportions to carbon depending on the chemical nature of the compound in which they occur. A pattern for the circulation of these elements in the nature developed when microorganism plants and animals appeared on the earth. The pattern was set by the physical and chemical environment, by the chemical nature of these elements and by the geographic distribution of the microorganism, plant and animals. The appearance of homo sapiens may not have had any great effect on these pattern as long as man was nomadic. That state of affairs changed when man formed settlements, where he

transported vegetable matter and meat and where he deposited most of his wastes. The effect must have been particularly noticeable for phosphorus which is hardly leached from soils. Analyses of soil phosphate have, incidentally, been used to locate archaeological settlements, (Arrhenius, 1931). Also in eastern Canada, clumps of shumack trees are used by archeologists as indicators of ancient inchan campfires. These trees flourish on phosphorous enriched soils (R.E.Munn, pers.Comm). Hence a steady flow of phosphorus took place from nearby pastoral and agricultural areas, ending up in the soils of the settlements and their immediate surroundings. It is of course, difficult to assess the impact of such a process on the environment. It is continuing today, with the difference that in some settlements a great deal of the accreted phosphors is released into lakes and rivers. In some regions agriculture has been practiced for a very long time which must have led to a sizeable depletion of phosphorus in soils, one reason for the present use of phosphorus fertilizers. Similar processes must also have occurred for nitrogen and sulphur, although their chemistry would favors leaching from soils or return to the atmosphere. In semiarid areas, however, archaeological sites sometime show accumulation of nitrate in and around former.

2.3.0 IMPLICATIONS OF THE REVIEW OF RELATED LITERATURE FOR THE PRESENT STUDY

31 studies were received by the researcher all the studies were based on environment pollution or its awareness and on biogeochemical cycles. The environmental studies are of India and the biogeochemical studies are of abroad .Two studies were doing sampling in laboratory find out soil pollution and water pollution by various tests such as BOD and COD test.

The other studies were focusing on environmental awareness among secondary school students more over survey method was used in study. One comparative study was them between Iran and India in this study the researcher found that the no of Indian students with average level of environmental awareness is more than their counterparts in Iran.

One study is from Turkey it is case study related to environmental awareness in this study the researchers work with active participate scale question and found environmental impact on students have less awareness. The studies found in India many focused that more emphasis should be given to environmental education subject as it should be a separate subject so that the students enjoy their work in environmental awareness and more of the studies also focused that the teacher training should also given with respect to environmental pollution

In this study, researcher wanted to do environment pollution awareness with respect to secondary school students with Experimental Research Design. In this research is trying to convey that the students can be aware with pollution by understanding them with chapter include in science and technology subject the topic is bio geo chemical cycle with its disturbance the pollution is

created which impact they badly to environment. The research is trying to aware the students with the help of concept of bio geo chemical cycle.

CHAPTER - III
METHODOLOGY

CHAPTER - III

METHODOLOGY

3.0 INTRODUCTION

The previous two chapters have given the rationale for the study undertaken, that is, the developing environmental awareness in 9th class students through biogeochemical cycle. The present chapter focus on the research methodology employed to achieve the objectives of the current study.

The methodology denotes the approach employed by the investigator for the purpose of a particular research. It deals with the research method or methods followed to achieve the objectives of the intended research.

3.1 PHASE -1: RESEACH DESIGN, POPULATION, SAMPLE, AND CONTENT OF THE STUDY.

The research is designed as quasi experimental design keeping the objectives in mind the research designed is chosen.

The prefix quasi means "resembling". Thus quasi-experiment research is research that resembles experiment research but is not true experimental research. Although the independent variable is manipulated, participants are not randomly assigned to conditions or orders of conditions (cook & Campbell, 1979). Because the independent variable is manipulated before the dependent variable is measurement, quasi-experiment research does not eliminate the problem of confounding variables. In terms of internal validity, therefore, quasi-experiments are generally somewhere between correlation studies and true experiments.

As the objectives were to develop environmental pollution awareness through biogeochemical cycle among class 9th students two schools were taken because due to corona crisis the strength of the student was less. One school was treated as experimental group and other as control group. As randomization was not done hence whether the group were equivalent or non equivalent was unknown to the researcher. After checking the equivalency based on pre-test of experimental and control group using t-test, researcher found that there is no significant difference between the two groups and hence both the groups were equivalent.

Population

The population of the study was all the students studying in English medium private school of class 9th in year 2020-21 of Gujarat state.

Sample of the study

The secondary school was selected purposively. Than from that selected school one school was selected for experimental group and another school for control group.

Content

The content was chosen from the Gujarat state board books and NCERT books of science and technology subject of class 9th in which natural resources.

3.2 PHASE-2: IDENTIFYING ENVIRONMENTAL POLLUTION AWARENESS AMONG STUDENTS

Students are asked many questions related there book content they are supposed to co relate the content with awareness of pollution than the students one by one tell all the types of pollution and causes but they are not able to co relate pollution causes effect with biogeochemical cycle. Than they are asked many questions and students are aware about relation of pollution with disturbances of biogeochemical cycles and its impact.

3.3 PHASE-3: DEVELOPMENT OF PRE-TEST AND POST-TEST

Pre –test is based on content present in the book basic questions were framed related to environmental pollution and biogeochemical cycles. Post –test is based on the content which students participate in experiment and the content which is in the form of experiment was taught to students and students also perform the task in it. And also learn the things with experiment this was done on experiment group students. In control group the things which students performed were only explained by traditional method. In experiment air pollution and soil pollution was explained and the role of biogeochemical cycle is understood. The questions in post –test were based on the air pollution, soil pollution and biogeochemical cycle.

3.4 PHASE-4: ADMINSTRATION OF PRE-TEST

Researcher instructs the students about the pre-test. The test was conducted online so the students were given all information like the timing of the test, mode of the test, answering in Google form , submitting the test in online class only . some students were doing fast and some were slow so they are ask to leave the class after completing their test .

3.5 PHASE-5: IMPLEMENTATION OF THE EXPERIMENT

First the students are explained all about the activity they have to do. This activity was conducted for air pollution. The explanation of the activity was done with the online class the students are explained all the steps of experiment. Than they are asked to do it at home and keep it for two days or one day and then observe it. And then we discussed it in class with students. Students responses in different ways and tell their observation.

Our second experiment was experiment cum demonstration in which students observe the experiment in online mode and conclude the experiment with their observation. The researcher

asked many questions and the discussions goes on. All the students got the understanding of environmental pollution with disturbances of biogeochemical cycles.

3.6 PHASE-6: ADMINSTRATION OF POST-TEST AND OBSERVATION.

The students are instructed to follow all the rules while giving post-test. The students should not leave the class before submitted their test. The students are free to ask questions when they are in problems in internet issues .the link of test is sending in whatsapp group so that the students can open it easily. The students are informed about the time and 5 minutes more are given to them.

During the experiment students observe many things and respond to it .they observes the changing color of litmus paper. They observe the acidic and basic nature of soil; they also learn about the nitrogenous bacteria, they also learn about the ph-value of scale.

CHAPTER – IV
DATA ANALYSIS AND INTERPRETATION

CHAPTER – IV

DATA ANALYSIS AND INTERPRETATION

4.0 INTRODUCTION

Analysis and interpretation of data is the most crucial phase in social science research. But, the challenge faced by the social science researcher is to make sense of a massive amount of data, reduce the volume of information, identify significant patterns, and construct a framework for communicating the essence of what the data reveal.

This chapter deals with the analysis and interpretation of the data collection through the tools viz. achievement test and observation. During the course of the experiment conducted. To convert the unprocessed data into substantial information it has to undergo analysis, and thereafter interpretation. The first step of the analysis is to understand the nature of data .here the researcher has obtained quantitative data.

The undertaken quantitative data is collected through a quasi – experiment research design. The data was collected by the investigator by administering achievement test in the two phases, that is pre-test and post –test on both the experimental and control group. Two different schools were taken of Gujarat state for collecting data .one school of Vadodara and other of Ahmadabad as the classes were going online due to pandemic time the data collection was very difficult. The pre-test achievement scores were used to make control group and experimental group equivalent.

The video recording, the class activity images and the experiment were recorded in experimental group.

4.1 EQUIVALENCE OF GROUP AFTER PRE-TEST.

As the second objective of the present study is to study the effectiveness of environmental pollution through biogeochemical cycle on the 9th class students a quasi-experimental design was conducted to collect the data .firstly the pre-test score of both the experimental and control group were compared.

Table 4.1 Mean, Standard deviation and t-value of pre-test

Groups	N	Mean	Standard deviation	t-value
Experimental group	25	8.96	2.6	0.095
Control group	25	8.88	3.4	

As suggested by table 4.1 the mean achievement score of the experimental and control group is 8.9 and 9.12 respectively. The standard deviation for experimental and control group is 2.6 and 3.4 respectively. The standard deviation for the two groups suggest that the experimental group is slightly more heterogeneous than the control group .the t-test value for the pre-test is 0.095 which shows that there is no significant difference between the mean achievement scores of experiment and control group in pre-test . Hence, we can say that both groups are equivalent.

4.2 COMPARISION OF PRE-TEST AND POST-TEST MEAN SCORE OF EXPERIMENTAL AND CONTROL GROUP.

Table 4.2 Pre-test and Post-test mean score of experimental and control group.

Groups	N	Pre -test	Post-test
Experimental group	25	8.96	12.36
Control group	25	8.88	9.32

From the above table it is found that the mean score in experimental pre-test and post-test achievement is more than that of control group. After performing experiment the experimental group is significant which suggest that while performing experiment the students are more aware to pollution and can connect biogeochemical cycle's disturbances with the cause of pollution. There is also the difference in the mean score of pre-test and post –test score in control group but the difference is lesser than the experimental group. Comparing the mean achievement score of pre-test and post-test in both experimental as well as control group we can infer that the doing by learning method is more helpful rather than traditional method .the students are more aware towards environment pollution while doing experiments or observing experiment them.

4.3 ACHIEVEMENT SCORE OF EXPERIMENTAL GROUP

The graph represents the achievement score in experimental group pre-test and post-test scoring with the name of students is there.
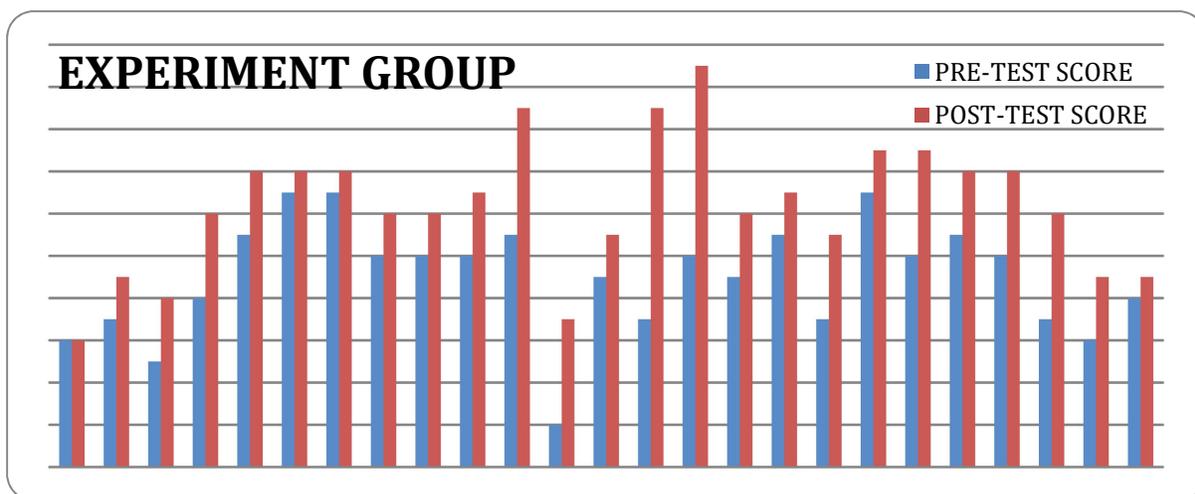
4.4 ACHIEVEMENT SCORE OF CONTROL GROUP
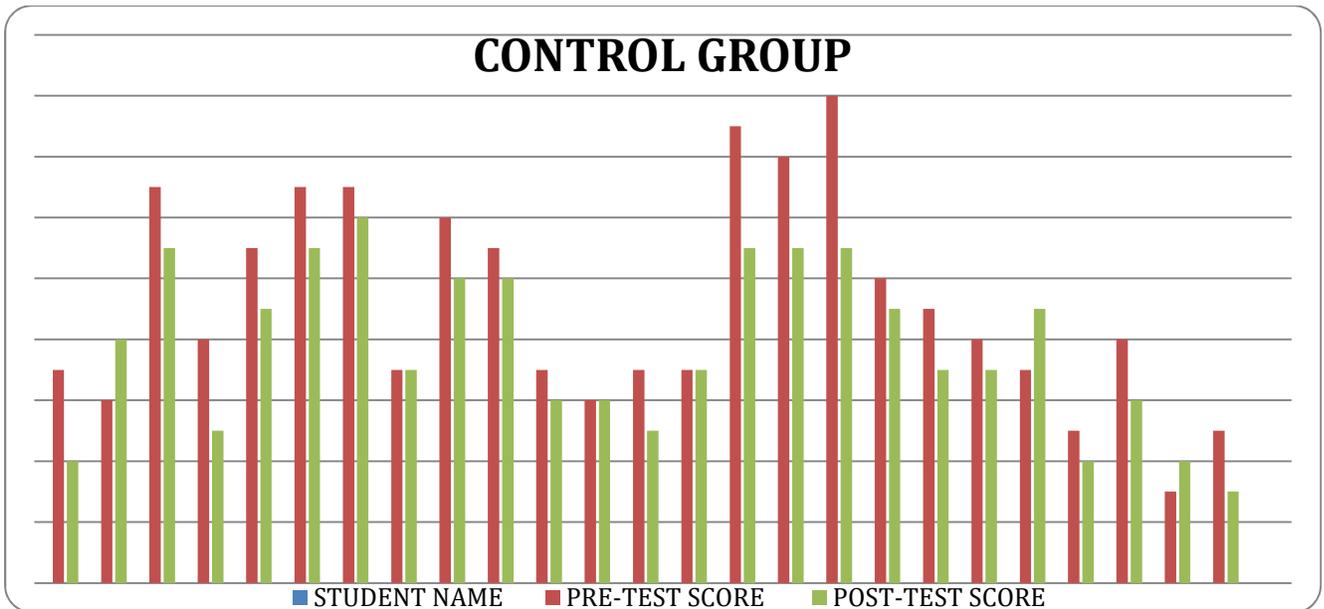
The graph represents the achievement score in control group pre-test and post-test scoring with the name of students is there.

4.5 COMPARING SKEWNESS AND KURTOSIS VALUE OF CONTROL GROUP AND EXPERIMENTAL GROUP.

Table 4.3 vales of skeweness and kurtosis in control group and experimental group.

STATIC DISCRIPTION	N	CONTROL GROUP	EXPERIMENTAL GROUP
SKEWENESS	25	0.1614	0.030
KURTOSIS	25	0.38	0.20

From the above table it is found that the skeweness value of the control group and experimental group is 0.16 and 0.03 respectively. The values are near to zero which means the data is symmetrical.

In kurtosis the values are 0.38 and 0.20 of control group and experimental group respectively. In kurtosis the value having negative values are plato kurtosis the value having zero are meso kurtosis and the value having positive values are lepto kurtosis. The above values are in positive and are lepto kurtosis.

4.6 RELATIONAL ANALYSIS OF DATA

The relationship between experimental group pre-test and post-test and control group pre-test and post-test score were found out using the statistical measures like Pearson's correlation which are given in the following tables. It also helps the researcher to test the formulated null hypothesis related to two variables of the study.

To find the correlation between experimental group and control group and to test the H01 i.e. "there will be no significance difference between mean value of experimental group and control group", analyzed data is presented in table followed by the interpretation

Coefficient of correlation, level of correlation and level of significance of Correlation between

EXPERIMENTAL GROUP PRE-TEST and CONTROL GROUP PRE-TEST

Table 4.4 co relation in experimental group and control group.

CORRELATION BETWEEN	R- VALUE	RELATIONSHIP	SIGNIFICANCE AT
Experimental group and Control group	0.4036	Moderate	0.01

It has been observer from the table 4.7 that the calculate r-value of the correlation between experimental group and control group was found to be 0.4036 which can be referred as positive and substantial correlation (page. 176 of (Garrett, 2008) between the variables. Further, referring the table 15 (page 201) of (Garrett, 2008) for the degree of freedom (df) 152 at the significant level of 0.01, the calculated value was found to be greater than the table value (0.208). Hence, the **H01** i.e. ―There will be no significant relationship between mean score of pre-test of experimental group and control group ‖ is rejected. So it can be said that the correlation between experimental pre –test score and control group pre-test score was found to be positive, substantial and significant.

COEFFICIENT OF CORRELATION, LEVEL OF CORRELATION AND LEVEL OF SIGNIFICANCE OF CORRELATION BETWEEN EXPERIMENTAL GROUP POST-TEST AND CONTROL GROUP POST-TEST

Table 4.5 correlation between post –test of control group and experimental group.

Correlation between	r-value	relationship	significant

Experimental group and control group	0.198	Moderate	0.01

It has been observer from the table 4.7 that the calculate r-value of the correlation between post – test of experimental and control group found to be 0.198 which can be referred as positive and substantial correlation (page. 176 of (Garrett, 2008) between the variables. Further, referring the table 15 (page 201) of (Garrett, 2008) for the degree of freedom (df) 152 at the significant level of 0.01, the calculated value was found to be greater than the table value (0.208). Hence, the **H01** i.e. ―There will be no significant relationship between mean score of pre-test of experimental group and control group ‖ is rejected. So it can be said that the correlation between experimental pre –test score and control group pre-test score was found to be positive, substantial and significant.

It is found that the correlation between experimental and control group is positive .it shows the relation between environmental awareness and biogeochemical cycle.

As the first objective was to study the developing of environmental awareness among class 9th students .it was done with the help of an activity which was conducted in class .the students were ask to make the pollution catcher the experiment and the process is as follow:

EXPERIMENT – 1

Objective- To catch the pollution by pollution catcher.

Material required- One paper dish, scissor, thread, Vaseline or petroleum jelly.

Steps to be follow:-

1. Take a paper dish make a whole in paper dish.
2. Apply or put Vaseline on paper dish
3. Than attach tread with the dish and hug it outside the house in gallery or in window
4. After 1 day they will found there will be dust particles on it and they will know that the surrounding is fall polluted and find the air pollution.

Observation:-
They will observe that the paper dish contain patches of dust on paper dish and know that the air is polluted nearby them and they have to take precautions or have to leave from that place.

Result: -
From the above experiment the students will know about air pollution surrounding them and they will be able to take precaution with it.In this many students participate and make pollution catcher. Than discussion takes place in which students asked many question like one of the

student name shruti ask : maam dust on paper dish is more it means our area is more polluted that's why we are having problem in breathing.

Replied: yes when the co2 value in the atmosphere is more its affect the air and pollute it.

In this way another student name risabh ask maam what to do to prevent pollution in our area.

Replied: plantation is the best way to decrease the rate of pollution .plant more and more plants.

The students were responding and participating actively.

One student named mona asked maam what is the role of biogeochemical in air pollution.

Replied: due to the disturbances of co2 and o2 cycle the respiration is not going properly and the atmosphere is not clean so we take in polluted air which causes infection and breathing problems.

The second experiment is about soil pollution how soil pollution is caused by disturbances of biogeochemical cycle. Experiment is as follow:

EXPERIMENT -2

Objective- To identify the quality of soil for productivity of crop or plant.

Material required-Glass, soil, water, litmus paper, universal ph-scale.

Procedure-
1. Take glass full of water put some amount of soil in it.
2. Keep the glass for 10 mins.
3. The soil will settled down after 10 mins and the water comes up.
4. In that water put litmus paper and tests it.
5. Then take the ph-scale paper and pour it in water and test it and match the color with the ph-scale.

Observation-

1. The litmus paper color will change.
2. The ph-paper color will also change and it will matches with the color of ph-scale.

Result-

1. The litmus paper becomes red in color.
2. The ph value is more than 7.

From the above experiment the quality of soil is determined .its nature whether it is acidic or basic can be find out. If the litmus paper is of red color it is basic and if it is blue in color it is acidic. If soil have acidic in nature it will shows less productivity .the soil is less fertile.

Another experiment is of ph value if the ph-value is less than 7 it is acidic in nature. If the ph-value is more than 7 it is basic in nature.

The experiment can be shows the importance of nitrogen cycle .the role of nitrogen cycle in making soil fertile and helps in the productivity of crops. But if the cycle is disturbed or imbalance the whole process will also affect.

In this experiment I prepared one video of experiment cum demonstration and show students about acidic and basic nature of soil.

In online class also I performed the whole experiment and after that we have a discussion. This is the part of experiment it is images of litmus paper changing color.

The changing of color makes interest in students to know about acidic and basic nature of soil. Which help them to aware about environment and create an idea about pollution increasing in them?

The ph value knowledge is also given to students with the help of slides. Bharat, sneha, and poonam asked questions related to this and role of nitrogen cycle in it.

The students do work at the time and send images and participate in it.

In this way the objectives of the studied were done and the whole experimental process was done during online classes.

CHAPTER-V
SUMMARY AND CONCLUSION

CHAPTER-V

SUMMARY AND CONCLUSION

5.0 INTRODUCTION

Education is the act or process of imparting or acquiring general knowledge, developing the powers of reasoning and judgment, and generally of preparing oneself or others intellectually for mature life.

Environmental education is a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment. As a result, individuals develop a deeper understanding of environmental issues and have the skills to make informed and responsible decisions.

Maybe some of you have seen posters, ads, and the like carrying the exhortation "Go Green!" But, what does it mean to "go green"? It takes a variety of forms, but essentially, going green means being mindful of the natural environment and making economic choices that aren't harmful to the earth. For example, this might mean purchasing a glass or ceramic water bottle instead of using disposable plastic water bottles. Plastic takes an incredibly long time to break down, and a significant percentage of plastic makes it to the oceans, where it kills plant and animal life. Going green might also involve using an all-natural hair-care product, instead of a can of aerosol spray containing toxic chemicals

When people "go green," they are practicing **environmental awareness**. The term means exactly what you expect it to: being aware of the natural environment and making choices that benefit-- rather than hurt--the earth. In recent years, environmental awareness has gained increased attention. It is fair to say it has become a bit of a trend: from environmentally friendly tiny homes to organic food, environmental awareness is a hot topic. However, it is nothing new and it ought to be more than just a passing fad because of its importance. Let's dig deeper and learn more about environmental awareness.

The ways in which an element—or compound such as water—moves between its various living and nonliving forms and locations in the biosphere is called a **biogeochemical cycle**. **Biogeochemical cycles** important to living organisms include the water, carbon, nitrogen, phosphorus, and sulfur **cycles**.

Environmental pollution is the unfavorable alteration of our surroundings, wholly or largely as a byproduct of man's actions, through direct or indirect effects of the changes in the energy pattern, radiation levels, and chemical and physical constitution and abundance of organisms. Environmental pollution is a global problem and is common to both developed as well as developing countries, which attracts the attention of human beings for its severe long-term consequences. The decline in environmental quality as a consequence of pollution is evidenced

by loss of vegetation, biological diversity, excessive amounts of harmful chemicals in the ambient atmosphere and in food grains, and growing risks of environmental accidents and threats to life support systems. Pollution is viewed from different angles by different people but is commonly agreed to be the outcome of urban-industrial and technological revolution and rapacious and speedy exploitation of natural resources, increased rate of exchange of matter and energy, and ever-increasing industrial wastes, urban effluents, and consumer goods. Hold gate (1979) defined environmental pollution as the introduction by man, into the environment, of substances or energy liable to cause interference with legitimate uses of environment. Singh (1991) has defined pollution in a very simple manner, i.e., "Disequilibrium condition from equilibrium condition in any system." This definition may be applied to all types of pollution ranging from physical to economic, political, social, and religious. Over the past couple of decades, various sources of pollution were identified that altered the composition of water, air, and soil of the environment. The substances that cause pollution are known as pollutants. A pollutant can be any chemical (toxic metal, radionuclide's, organ phosphorus, gases) or geochemical substance (dust, sediment), biological organism or product, or physical substance (heat, radiation, sound wave) that is released intentionally or inadvertently by man into the environment with actual or potential adverse, harmful, unpleasant, or inconvenient effects. Such undesirable effects may be direct (affecting man) or indirect, being mediated via resource organisms or climate change. Depending on the nature of pollutants and also subsequent pollution of environmental components, the pollution may be categorized as follows: air pollution, water pollution, soil/land pollution, noise pollution etc.

5.1 RATIONALE OF THE STUDY

As the government of India had make the compulsory subject of environment science and environment awareness with that students are connected to environment activities performed by the students and teachers and are connected to problem which are an environment but it is seen that only subject knowledge is there in student. They do not have such awareness regarding atmosphere. They study types of pollution, their causes and effect but what work should be done to decrease the problem they don't do practically many of the students do not know how their topic of chapter is connected to surrounding because teacher do not correlate the chapter's topic with environment awareness. In this study researcher is focusing on bio geo chemical cycle and environment awareness that how the cycles works and with its disturbances what impact is seen in environment purification of air, smog, plastic ban, recycling of things and many more.

As researcher review that in many studies the survey method was used drawing MCQ questions and taking test. There was no study was done regarding bio geo chemical cycle and environmental awareness. These studies were conducted on environmental awareness with respect to knowledge and attitude toward environmental. The researcher in her studies wants to correlate the bio geo chemical cycle with environmental awareness with experimental research

design. Researcher wants to perform various activities to aware students about environmental problem cause by the disturbances of bio geo chemical cycles.

Few years ago only theoretical knowledge was used to aware about environmental pollution. Activities like tree plantation, poster making, slogan writing etc. were there but nobody teaches from were atmospheric gases comes. Do they affect individual or not. For example oxygen cycle in atmosphere helps in respirations. Now what will happen if the cycle will get affected whole human activities also get affected. We plant trees but we do not take care of it. From these plants we take oxygen in and carbon dioxide out which is used by plants. So in this way we can correlate all bio geo chemical cycle with environment awareness or pollution awareness researcher is doing this study for awaking students of class 9th about pollution present in atmosphere due to disturbances of bio geo chemical cycle.

5.3 STATEMENT OF THE PROBLEM

"Developing environmental pollution awareness among students of class 9th through bio-geochemical cycle"

5.4 OBJECTIVES OF THE STUDY

➢ To develop environmental pollution awareness among class 9th students.
➢ To study the effectiveness of environmental pollution through biogeochemical cycle.
➢ To understand biogeochemical cycles and impact of its disturbances.

5.5 HYPOTHESIS OF THE STUDY

There will be no significant difference in the pre test and post test mean score of the students of 9th class on environmental awareness and bio-geo chemical cycle.

5.6 EXPLANATION OF THE TERMS

1. **Pollution**: it is generally defined as the presence of any substance whose nature, location or quantity produce has desirable environmental effect or pollution is the impairment of the quality of some portion of the environment by the addition of harmful impurities.
2. **Awareness**: awareness is the ability to directly know and per cave, to feel or to be cognizant of events. It is states of being conscious of something.
3. **Biogeochemical cycle :** the cyclic pathways through which chemical elements like Hydrogen, Carbon, Oxygen, Nitrogen etc travel from the environment into the organisms and from the organisms into the environment regularly and continuously are called bio-geo chemical cycle. Bio includes the organisms; geo includes the soil, mocks, water etc, which continuously go round in the cycle in the atmosphere.

5.7 DELIMITATION OF THE STUDY

1. The study is delimited to class 9th students of English medium of Gujarat state.
2. The study is also delimited to Oxygen Cycle, Carbon Cycle and Nitrogen Cycle.

5.8 METHODOLOGY

The study is quasi-experimental study on environmental awareness and biogeochemical cycles. It is based on achievement test of students of 9th class in which pre-test and post-test is there and the second thing is discussion and observation.

5.9 POPULATION

The population of the study is students of class 9th of English medium of Gujarat state.

5.10 SAMPLE

Convenient sampling technique is used. Two Gujarat board English medium schools will be selected with the purpose of feasibility of the experimental group. Out of which one will be selected as control group and another as experimental group. The entire student studying in STD 9th will be the sample of the study.

5.11 TOOLS FOR DATA COLLECTION

Achievement test: as pre test and post test based on the content selected, the researcher will prepare a criterion reference test, with some criteria to be achieved during the teaching. And class discussion and observation was used during online class.

5.12 PROCEDURE OF DATA COLLECTION

The researcher take the permission from two different schools as both the schools gives limited time period for collecting data. The data was collected with the help of Google form quiz in which both pre-test and post –test is there.

During class, students performed experiments and the researcher observe them and have discussion with students.

5.13 STATISCAL ANALYSIS OF DATA

Data were analyzed with the help of EXCEL. For the purpose of descriptive analysis of data mean, standard deviation, standard error of mean, skewness and kurtosis was used. For the purpose of inferential analysis, product moment correlation was used as per the requirement of the data.

5.14 MAJOR FINDINGS OF THE STUDY

➤ The mean achievement score of the experimental and control group is 8.9 and 8.88 respectively.

➤ The standard deviation for experimental and control group is 2.6 and 3.4 respectively.

➤ The standard deviation for the two groups suggest that the experimental group is slightly more heterogeneous than the control group .the t-test value for the pre-test is 0.095 which shows that there is no significant difference between the mean achievement scores of experiment and control group in pre-test . Hence, we can say that both groups are equivalent.

➤ The mean score in experimental pre-test and post-test achievement is more than that of control group. After performing experiment the experimental group is significant which suggest that while performing experiment the students are more aware to pollution and can connect biogeochemical cycle's disturbances with the cause of pollution.

➤ The difference in the mean score of pre-test and post –test score in control group but the difference is lesser than the experimental group. Comparing the mean achievement score of pre-test and post-test in both experimental as well as control group we can infer that the doing by learning method is more helpful rather than traditional method .the students are more aware towards environment pollution while doing experiments or observing experiment them.

➤ The skeweness value of the control group and experimental group is 0.16 and 0.03 respectively. The values are near to zero which means the data is symmetrical.

➤ In kurtosis the values are 0.38 and 0.20 of control group and experimental group respectively. In kurtosis the value having negative values are Plato kurtosis the value having zero are meso kurtosis and the value having positive values are lepto kurtosis. The above values are in positive and are lepto kurtosis.

➤ The calculate r-value of the correlation between pre-test experimental group and control group was found to be 0.4036 which can be referred as positive and substantial correlation (page. 176 of (Garrett, 2008) between the variables. Further, referring the table 15 (page 201) of (Garrett, 2008) for the sdegree of freedom (df) 152 at the significant level of 0.01, the calculated value was found to be greater than the table value (0.208). Hence, the **H01** i.e. ―There will be no significant relationship between mean score of pre-test of experimental group and control group ‖ is rejected. So it can be said that the correlation between experimental pre –test score and control group pre-test score was found to be positive, substantial and significant.

➤ The calculate r-value of the correlation between post – test of experimental and control group found to be 0.198 which can be referred as positive and substantial correlation (page. 176 of (Garrett, 2008) between the variables. Further, referring the table 15 (page 201) of (Garrett, 2008) for the degree of freedom (df) 152 at the significant level of 0.01, the

calculated value was found to be greater than the table value (0.208). Hence, the **H01** i.e. —There will be no significant relationship between mean score of pre-test of experimental group and control group ‖ is rejected. So it can be said that the correlation between experimental pre –test score and control group pre-test score was found to be positive, substantial and significant.

5.15 DISCUSSION

- From the above findings it was observed that there is no difference between the mean score of pre-test and post-test of experimental group and control group.
- The co relation between pre-test control group and experimental group is positive and substantial and significant.
- The co relation between the post-test of control group and experimental group is positive, substantial, and significant.
- The skeweness value of the control group and experimental group is 0.16 and 0.03 respectively. The values are near to zero which means the data is symmetrical
- In kurtosis the values are 0.38 and 0.20 of control group and experimental group respectively. In kurtosis the value having negative values are Plato kurtosis the value having zero are meso kurtosis and the value having positive values are lepto kurtosis. The above values are in positive and are lepto kurtosis
- The observation of students during the experiment and during the activity shows the eagerness towards the environment awareness and about the biogeochemical cycles.

5.16 SUGGESTION FOR FURTHER STUDY

- The present research was limited to English medium school in Gujarat. The researcher would like to suggest some more area and issues for the further studies which are as below.
- The study can be done on high class students so that the biogeochemical cycles can understand in better way with deep knowledge.
- The study can be boarder in acquiring awareness environmental pollution through disturbances of biogeochemical cycles.
- The researcher can also study on sulphur cycle, phosphor cycle etc.

5.17CONCLUSION

This study was done on awareness of environmental pollution through disturbing biogeochemical cycles how environment is affected. Students of class 9th were given achievement test regarding this. It was observed that the students are aware of environment pollution but less aware about pollution by disturbances of biogeochemical cycles. The study

was more emphasized on human impact on biogeochemical cycles. The pollution caused due to disturbances of biogeochemical cycles is occurred and pollute the whole environment. Nitrogen cycle, carbon cycle, and oxygen cycle cause pollution the cycles are limited to the study.

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APPENDIX-1

ACHIEVEMENT TEST

The achievement test was conducted by giving multiple choice questions to students in each test 20 questions were there each having 1 point. The test was conducted in Google form as the online classes were going on the test was in the form of quiz both pre-test and post-test were conducted in presence of researcher students were completing their test submitting and leaving the class.

The attachment of both pre-test and post-test is given below.

PRE TEST QUESTIONNAIRES

Instructions: Read the entire question and answer them by tick mark.

Q-1 : Wht is water vapour ?
   a) it is gas b) a cloud droplet c) a rain drop d) a snowflake

Q-2 : The main energy source for the environment is _____
   a) solar energy b) chemical energy c) bioelectric energy d) electric energy

Q-3 : Which of the following gases is not a green house gas:
   a) Methane b) Carbon Dioxide c) Carbon Monoxide d) Ammonia

Q-4: In bio geochemical cycle chemical passes through
   a) living being b) non living being c) living being and non living being
   d) from living to non living and non living to living

Q-5 : Burning of fossil fuel affects
   a) Nitrogen cycle b) Carbon dioxide cycle c) Oxygen cycle d) water cycle

Q-6 : By the disturbances of nitrogen cycle which pollution is highly affected?
   a) Soil Pollution b) Air Pollution c) Thermal Pollution d) Noise Pollution

Q-7: In nitrogen cycle which will play an important role
   a) Rhizopus   b) Nitrobacteria   c) Mucor   d) All green alage

Q-8 : Which of the following contribute to the carbon cycle.

a) Photosynthesis   b) Respiration   c) Fossil fuel contribution   d) All above

Q-9: Warming of green house is due to-

a) Infra-red rays reaching the earth b) Moisture layer in the atmosphere

c)increase in temperature due to increase in CO2 concentration in atmosphere

d) the Ozone layer of atmosphere

Q-10 : Deforestation will decrease

a) Soil Erosion b) Land Slides c) Soil Fertility d) Rain Fall

Q-11 Domestic waste constitutes

a) Non biodegradable pollution b) Bio degradable pollution

c) Noise pollution   d) Air pollution

Q-12 : Renewable source of energy is

a) Biomass b) Coal c) Petroleum   d) Kerosene

Q-13 : One of the following process is not a step involved in the water cycle

operating in nature

a) Evaporation b) Transpiration c) precipitation d) Photosynthesis

Q-14: Ozone - hole means

a) a large sized hole in the ozone layer

b) thinning of the ozone layer

c) small holes scattered in the ozone layer

d) thickening of ozone in the ozone layer

Q-15: Less plantation can be done is urban areas.

a) Yes   b) No

Q-16: The students living near mining areas should not wear mask.

a) True   b) False

Q-17: Do all bio geochemical cycles are linked with each other…
    a) Yes   b) No

Q-18: Woods are used for cooking food in villages do they cause pollution?
    a) Yes   b) No

Q-19: Many of the health problems are caused by environmental pollution.
    a) Agree   b) Strongly Agree   c) Disagree   d) unable to decide

Q-20 : Do environment is affected due to disturbances in bio geochemical cycle
    a) Agree   b) Strongly Agree   c) Disagree   d) unable to decide

APPENDIX -2

POST-TEST QUESTIONAIRE:

1. ? Which of the following is a symbiotic nitrogen fixing microorganism in nitrogen cycle
a) Azospirillum   b) rhizobium

c) Clostridium   d) nitrococcus

2. Major aerosol pollutant in jet plane emission is :
 a) Sulphur dioxide   b) carbon monoxide

 c) Methane   d) fluorocarbon

3. Deforestation will decrease:

   a) Soil erosion   b) soil fertility
   c) Rainfall   d) land slide

4. Sewage, municipal waste, industrial effluents,   agriculture waste, and oil spills are the main cause of:

a) Non-biodegradable pollution
b) Biodegradable pollution
c) Air pollution
d) Noise pollution

5. Most of the global warming is due to the perturbation of which of these cycle:

a) Water cycle
b) Carbon cycle
c) Nitrogen cycle
d) Sulphur cycle

6. Respiration and photosynthesis are central of these cycles:

a) Nitrogen cycle
b) Carbon and oxygen cycle
c) Oxygen cycle only
d) Carbon cycle only

7. What is the full form of PUC?

a) Population under control

b) Pollution under control

c) Pre-degree certificate

d) Plantation under control

8. What is the ph-value of acid rain water?

a) Up to 7

b) Below 7

c) Zero

d) Between 7 to 14

9. For what purpose TDS meter is used?

a) To check purity of water

b) To check purity of air

c) To check purity of carbon

d) To check purity of oxygen

10. By the disturbances of which cycle air pollution is highly affected.

a) Water cycle

b) Nitrogen cycle

c) Carbon cycle and oxygen cycle

d) Sulphur cycle

11. What is the full form of CNG?

a) Compressed natural gas

b) Compressed neutral gas

c) Composition of natural gas

d) Cylinder natural gas

12. Which cycle is more affected with plastic pollution?

a) Water cycle

b) Nitrogen cycle

c) Carbon cycle

d) Oxygen cycle

13. What type of soil is use for production of crops? Soil whose:

a) Ph-value is less than 7

b) Ph-value is more than 7

c) Ph-value is neutral

d) Ph-value is between 1 to 5

14. When we stop buying plastic bottles it will help in decreasing plastic pollution:

   a) Strongly agree
   b) Agree
   c) Disagree
   d) Unable to decide

15. It is very important to do PUC of vehicles time to time because it helps in environment protection:

   a) Agree
   b) Disagree
   c) Strongly disagree
   d) Unable to decide

16. The term biogeochemical cycle is used for exchange\circulation of biogenetic nutrients between living and non-living component.

   a) Agree
   b) Strongly agree
   c) Disagree
   d) Unable to decide

17.CNG in auto-rickshaws, cars, and buses is used as fuel rather than petrol, diesel, or LPG because it is less environmentally clean alternative to those fuel , and is not safe than other fuel.

   a) Agree
   b) Disagree
   c) Strongly disagree
   d) Unable to decide

18. Use of polythene harm to living being and environment.

   a) True
   b) False

19. The raw material to make plastic is oil.

   a) True
   b) False

20. The ph-value of drinking water lies between the ranges of 6.5 to 8.5.

   a) True
   b) False