NATIONAL OPEN UNIVERSITY OF NIGERIA

SCHOOL OF EDUCATION

COURSE CODE: SED 413

COURSE TITLE: SCIENCE, TECHNOLOGY AND SOCIETY

TABLE OF CONTENTS

MODULE 1:THE MEANING AND HISTORICAL DEVELOPMENT OF SCIENCE TECHNOLOGY SOCIETY

INTRODUCTION

In this module, you will be exposed to the concept of Science Technology and Society(STS).

STS have over the years been recognized as an approach that looked into the way the teaching of Science should be looked into in the classroom. It is the teaching and leaving of Science in the context of human experiences. This module is concerned with exposing the students to the historical development of STS. It willexamine the meaning of:

- Science-technology-society
- Science
- Technology
- Society
- Inter-relationship between Science- Technology and Society.

The module is divided into five(5) Units as follows:

Unit1 Historical Development of STS

Unit 2 Meaning of Science

Unit 3 Meaning of Technology

Unit 4 Meaning of Society

Unit 5 Relationship between Science – Technology and Society

UNIT 1: HISTORICAL DEVELOPMENT OF SCIENCE- TECHNOLOGY SOCIETY(STS)

1.0 INTRODUCTION

This unit will expose you to the meaning of Science-Technology-Society. Also a brief discussion of its historical development will be done.

2.0 OBJECTIVES

After studying this unit you should be able to:

- Explain the meaning of STS
- Historical development of STS
- Rational for STS

3.0 MAIN CONTENTS

3.1 WHAT IS SCIENCE–TECHNOLOGY SOCIETY (STS)

STS can be defined as the teaching and learning of science in the context of human experience (Yager 1992). It emerged from the confluence of a variety of disciplines and disciplenary subfields, all of which had developed an interest in viewing science and technology as socially embodied enterprises. It is a

discipline that embdies the relationship of scinece and technology and how the two shape the society and vice- verse. It considers how social, political and cultural values affect Scientific research and technolgical innovation, and how these, in turn affect society, politics and culture.

3.2 Historical development of STS

Science – Technology Society (STS) as an interdisciplinary program, emerged from the confluence of a variety of discipline and disciplinary subfields, all of which had developed an interest during the 1960s and 1970s in viewing science and technlogy as a socially embedded enterprise. Drawn from a variety of disciplines, including anthropology, history, political science and sociology.Scholars in theses programs created undergraduate curricular devoted to exploring the issues raised by science and technology .

STS has its root from united Kingdom first, as Science in society (Lewis 1981) and second as science in social context (Solomon, 1983). Many attempts were made in the United State to intiate STS programme in the Secondary Schools; but STS did not get underway until 1981 with the report of Norris Harm's Project Synthesis Study (PSS).

The decades that followed saw STS gaining recognition and subsequently its national professional body – Natioanal Association for Science Technology Society (NASTS) was formed. During this time, several major National Science Foundation (NSF) grants were awarded to foster STS projects. The first of such grants was awarded to Rusttum Roy in 1985 which supported a project known as science through STS. Science Technology Society has been called the megatrend in science education. Others called it aparadigm shift for the field of science education. The Science Teachers Association of Nigeria (STAN) called STS the central goal for Science education.

4. 0 CONCLUSION

In this unit you are exposed to the meaning of science Technology society and its historical development.

5.0 SUMMARY

In this unit we have learnt that Science Technology Society (STS) can be defined as the discipline that is designed to raise a generation of citizens who understand the nature of things in the enviroment: a generation of citizens who are aware of changes taking place around them; a generation who can adjust to the changes in the enviroment; a generation who is equipped to deal with forces that influence the future; a generation who can take the future in her hands.

The unit also discusses the historical development of Scinece-Technology-Society (STS).

6.0 TUTOR – MARKED ASSIGNMENT

1. In your own words explain what STSis?
2. Give 2 reasons why STS was developed?

7. 0 REFRENCES / FUTURE READINGS

Solomon, J (1983). Scinece in a Social Context

United Kingdom; Basil Blackwell and the Association for Science Education

Yager, R.E (1992). Science – Technology – Society

as a reform. School Scinece and Mathematics . 93(3), 145 - 158

UNIT 2 MEANING OF SCIENCE
CONTENTS

UNIT 2 MEANING OF SCIENCE

1.0 INTRODUCTION

In this unityou will be exposed to the meaning of science and the nature of science which will be discussed under the

i) The product of science

ii) Science as a human enterprise

Also the objectives and philosophy of science will be looked into

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Define science in your own words
- List the processes of science
- Explain what the processes of science are
- Describe what the product of science is and give examples
- List and explain the attitudes of a scientist

3.0 MAIN CONTENT

3.1 Meaning of Science

Science can be define as a process of investigation involving activities or processes known as science skills; which include observation, hypothesizing measuring, experimenting and so on. These activities lead to the production of body of knowledge whoch are the product of science. This body of knowledge comprises of principles facts, theories, concepts and laws. Thirdly science is a human enterprise with a social dimension carried out by a group of practitioners with certian attitude, values and dispositions that include certain qualties such as honesty, curriously , humility, objectivity, openmindedness and so on.

DEFINITION OF SCIENCE

Mani (1985) defined science as a systematized body of knowledge and a process of inquiry carried out in order to study the would around us. Holkbrook (1992) defined science as an intellectual acitivity through which men seeks to understand nature. Gottlieb (2004) viewed science as an intellectual acitivity carried out by human that are designed to discover information about the natural world in which humans live and to discover the ways in which this information can be organized into meaningful patterns.

3. 2 THE PRODUCTION CONTENTS OF SCIENCE

The product content of science of science refers to the organized body of knowledge embedded in fects, concepts, principles laws, and thories. It is the product of scientific investigations. it is through the use of the products of science that regularities. In nature are describe, explained and predicted. This organized body of knowledge is testable, falsifiable, verifiable, contingent and debatable (Schwab 1962). Scientific knowledge is tentative and it changes with time to accomodates available opposing data.

Activity 3

1) What are scientific theories
2) What are scientific laws
3) Give 2 examples each of scientific theories and laws in chemistry

3.3 THE PROCESS CONTENT OF SCIENCE

Science is a process and means by which man investigates his world and gains knowledge about it. The processes of science relate to those activities carried out by scientists during a scientific investigation include:

- Observation
- Classification
- Measurement
- Prediction
- Problem identification
- Testing hypothesis
- Analyzing
- Inferring
- Experimenting
- Collection of data
- Interpretation of data
- Exptrapolating
- Drawing valid conclusion etc.

  From the above list, it is evident that scientific processes involveseveral activities in an effort to obtain valid generalization and to raise the right kinds of questions about objects and events around us.

3.4 SCIENCE AS A HUMAN ENTERPRISES

Science is an activity of man carried out in order to know more about his enviroment. This human investigative aspect of science is dynamic since it inolves the action of men as they penetrate the unknown. This acitivity of man's effort to increase his understanding of his natural enviroment has been greatly influenced by the acceptance of identifiable procedures, belief, and ethical standards. This aspect of the nature of science deals with the attitude and behaviors of scientist. These include:

- Rationality

- Objectivity
- Suspending judgement
- Critical mindedness
- Open – mindedness
- Honesty
- Humility
- Intense curiosity: A scientist is not a casual observer. He asks question and seeks answers by carrying out investigations
- Rationality: the search for plausible solution is not influenced by supersitious explanation. The scientist seeks natural events and is cautious not to permit decision to the affected by personal likes or dislikes, fear, anger or ignorance.
- Objectivity: the scientific is not guided by personal feelings and does not let his feeling interface with the impersonal judgement needed in collecting and interpreting data.
- Suspending judgement: the scientist should be reluctant to form a generalization based upon inadequate evidence. Jugedments are made only after the acculation of sufficient evidence .
- Critical – Mindedness: a scientist is not available consumer of information but rather the questions the source of information and its reliability.
- Open – mindedeness: the scientist does not hold tenaciously to his own ideas. He should exhibit a willingeness to change his mind in light of new evidence.
- Honesty: the scientist expresses a reluctance to compremise with the truth. He consciously reports all observation in a truthfl manner.
- Humility: the scientist as he matures should develop a recognition of his own limitations as well as the limitations inherent in science itself.

3.5 a) OBJECTIVES OF PHILOSOPHY

Why Teach Science

The Objcetive of science teaching are 3 – folds and are derived the nature of science itself. The objective are:

1. To develop the cognitive or intellual ability of the students by the product content of science

2. To develop the psychomotor abilities of the student with particulars reference to problem – solving skills gained through the mastery of science processes
3. T o develop in the students the scienctific mindedness and fovourable outlook towards science its benefits to mankind.

b) PHILOSOPHY OF SCIENCE

The Philosophy of science concerns itself with how we come to know what we know about NATURAL PHENOMENA. It deals with assumption concerning.

1. The nature
2. The Processes and products of scientific investigations.

The philosophy of science regards science as a human enterprises and as such subject to human weaknesses. Science therefore is not the epitome of truth but a DUBITABLE, REVISIONARY human enterprises. Hence according to schwab(1962), science is TENTATIVE DUBITABLE, ANTI-AUTHORITARIAN CONTINGENT, REVESIONARY rather than a rhetoric of conclusion.

Actitvity

Check in your dictionary the meaning of th words:

- Tentative
- Dubitable
- Anti- authoritarian
- Contingent
- Revisionery

4. 0 CONCLUSION

Science though can be defined differently by different scientist,all have one single aim. That is to study the world around us making use of our senses. This study follows the scientific method which comprises of

- Identification of problem
- Formulating hypotheses
- Conducting experiments
- Collection of relevant data
- Recording and analysis of data collected

- Drawing conclusion

5.0 SUMMARY

In this unit, we have learnt the following:

i) That science can be defined in terms ofproducts of science(bodyof knowledge),processessof science (Scientific skills), human enterprises.

ii) What the content productsof Science are.

iii) What the processes of science arc.

iv) What the attitudes of science arc.

6.0 TUTOR MAKED ASSIGNMENT

a. I. In your own word, define science?

ii. Discuss the definition of science by two authors apart from the ones given to you.

b. What is:

i. Scientific Concept
ii. Scientific Theory
iii. Scientific law
iv. Give two example of each of them

c. List ten process of Science

d. List and Explain 5 attitude of a Scientist.

7.0 REFERENCES/ FURTHER READING

Abdullahi, A. (1982). Science Teaching in Nigeria. Atoto Press Limited, Ilorin

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UNIT 3: MEANING OF TECHNOLOGY

1.0INTRODUCTION

In this unit, you will learn the meaning of Technology and its philosophy. The products of technology are all around us; in what we do in our everyday life. Technology is not static, it is dynamic. It is transfered from the producer to the receptor and there are different tools that can be used in the transfer of technology.

2.0OBJECTIVES

By the end of this unit, you should be able to

- Explain the nature and meaning of technology
- Discuss the philosophy of technology
- List some technological products that are used at home and enviroment
- Explain what technology transfer is

MAIN CONTENTS

3.1 What is Technology

Black and Harrison (1985) defined technology as a disciplined process that uses the resources of matter, energy and natural phenomena to achieve human purpose. It is the practical application of scientific results for the development of tools, equipment and techniques. Thus,

the invention of the telescope, of techniques of cooking, canning, bottling or preservation, or of medicaments to reduce body pains are seen as technologies.

Technology employs knowledge, skills and tools to improve human potentials, to solve practical problems, to modify our enviroment. It is therefore concerned with the application of science to obtain practical solution to the myriad of human problems.

3.2 PHILOSOPHY OF TECHNOLOGY

The philosophy of technology seeks to classify the objectives of technology and the methods used by technology, and hands – on activities. It also emphasizes that the training enviroment should be a replica of the actual enviroment where the knowledge acquired can be utilised (NTI 2011).

3.3 HISTORY OF TECHNOLOGY

The history of technology is as old as mankind. Tools are made and used by archaeologists more than a million years ago. The discovery and utilization of fire, a simple energy source with many uses was a turning point in the technological revolution.

3.4 TECHNOLOGICAL PRODUCTS IN THE ENVIROMENT

Endence of technology abound around us in the enviroment. Technology is not only the modern machines like cars, generators, aeroplanes, ships , but also things we do and use in our enviroment to make work easy. For intance, woman use the grinding stone in the kitchen. Pot moulding is a common technology in Africa.

3.5 TECHNOLOGY TRANSFER

Technology Transfer is also referred to as Transfer of Technology (TOT). It is the process of tranferring skills, knowledge, technologies, methods of manufacturing, sample of manucturing and facilities among governments or universities and other institutions to ensure that scientific and technological development are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials or services.

In Technology Transfer we have the producer and the receptor system. TOT's are needed to move the technology from the produces to the receptors: example of TOT's are Marketing tools which may include fact sheets and special publications, magazines articles, workshops, exhibits, demostrations of new developed products, videotapes, and market surveys. Other

technology transfer tools are aimed at providing incentives to potential users and commercializers of the technology.

4.0 CONCLUSION

In this unit we have discussed nature, philosophy and history of technology. Also the Technological products in the enviroment as well as Transfer of Technology were looked into.

5.0 SUMMARY

In this unit you have learnt that technology is the practical application of knowledge to the needs of the society. Also you have learnt that most of the gadjets used in the enviroment as well as the ways they are operated are all examples of technolgy. Technology has to be tarnsfered from the producer to the receptor if use is going to be made of the technology. Hence the need for tools of transfer of technology.

6.0 TUTOR – MARKED ASSIGNMENT

1. Explian the word Technology in your own words
2. What is Technology Transfer
3. List 4 examples of tools of Technology Transfer

7.0 REFERENCES

NTI(2011), Basic Science & Technology.

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Bichi, S.S (2008) Resource for Science Technology

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Agrawal, S.P (2005) " Technology Transfer Trends"

CACCI Journal vol 2 : 1- 8

UNIT 4 NATURE OF SOCIETY

1.0 INTRODUCTION

In Units 2 and 3 you were exposed to the meanings of Science and Technology. Society is the third part of STS. In this unit, you will learn the meaning of society and its impacts on Science.

2.0 Objectives: At the end of this unit students should be able to:

1) Explain the meaning of society.

2) Describe what a social institution is and give 4 examples of social institutions.

3) Explain Science as a Social Institution.

4) List 4 posture and 4 negative effects of society on Science.

3.0 MAIN CONTENT

3.1 CONCEPT OF SOCIETY

Society can be defined as a group of humans living together for self maintenance and self perpetuating and sharing their own institution and culture (Yager 1992). It could also be defined as a long – standing group of people shaving cultural aspects such as languages, dress, norms of behaviours and artistic forms. A formal association of people with similar interest e.g Medical Society, Science Teachers Society are all examples of societies.

Activity 3.1 List four Examples of Societies in your Community

3.2 SOCIAL INSTUTITION

A social institution is a social arrangement that directs or channels behaviours in prescribed ways in important areas of social life(Eitzeu & Zinn,2001).Social institution are interrelated sets of normative elements consisting of norms, values and role expectations. They are devised by the people making up the society and which they pass on to succeeding generations in order to provide permanent solutions to society's perpetually unfinished business. They provide procedures through which human conduct is patterned and propelled to go. Examples of social institution are:

- Medicine which takes care of the provision of physical and emotional health care.
- Polity as a social institution takes care of maintenance of order and distribution of power
- Economic systems is the social system that cares for production of goods and services and ownership of property.
- Science as a social institution makes for the understanding of the universe.

3.3 SCIENCE AS A SOCIAL INSTITUTION

Science as a social Institution comprises of not only scientists, professional societies, universities but is also a way of thinking and doing. It came into being as a result of human thoughts, actions and behaviour pattern, designed to help man understand and control his enviroment (Code & Shynn, 2006). The invention of Science according to them, was not a thought out plan but represented the coming together of numerous social, economic and philosophical developments that coalesced in a remarkable creatives way. Science therefore as a social institution is interwoven within a network of other institution which gave it life and continue to sustain it. As part of the network, science affects these other institutions individually and collectively and on their own part these institutions affect Science.

Activity 3.3: Describe 2 ways in which society affects Science

3.4 IMPACT OF SOCIETY ON SCIENCE

Despite the internationality of Science and technology, the society affects Science positively and negatively.

a) Negative Effects of Society on Science:

- Effects of Cultural / Religious Beliefs and Values-

For nearly over two centuries, Scientists all over the world faced the threat of the church. For example, findings particularly in genetics which contradicted the Holybooks were considered abomintation.

- Scientist such as Maxwell and charles Darwin faced a lot of societal condemenation based on Darwin's publication " the origin of species".
- The taboo and superstions held by the society have negatively affected the growth of Science in Nigeria.
- The belief that Science is done by only those with above average intelligence and the scare that Science is abstract and mathematical has stereotyped potential young men and women against Science.

Activity 3.4:List 2 other negative effects of society on Science,apart from the above listed negative effects.

b) Positve Impact of Society on science

- Supporting Science Research:With increasing awareness of the role of Science in moulding the world's progress, researchers are intensified in both pure and applied Science
- Money needed for researches are provided principally by the governments of several countries. In developed nations, like United State of America, Germany, and England, the private sectors contribution to scientific research is tremendous. In this way the society affects Science positively with the support for research.
- Award of Prizes

Universities and other related institutions all over the world recongnize the performance of their students in the various pure and applied Scientific disciplines. Individuals and corporate bodies provide prizes to the best graduants in various disciplines or courses in science. This has tremendously motivated college students to have interest in Science and by implication the growth of Scientific knowledge.

4.0 CONCLUSION

This units has exposed you to know more about what society is, social institution and Science as a social Institution. The impact of society both negatively and positively are also discussed.

5.0 SUMMARY

The following were learnt in this Unit:

- Meaning of Society
- Meaning of social Institution
- Science as a Social Institution
- Negative effects of Society on Science
- Positive effects of Society on Science

6.0 TUTOR – MARKED ASSIGNMENT

The development of Scientific knownledge has been affected by society. Discuss this statement

7.0 REFERENCES / FURTHER READINGS

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institution. Cambridge: MJT Press

Etizeu, A and Zinn, O. (2001). In Conflict and order.
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as a reform. School Scinece and Mathematics . 93(3), 145 - 158

UNIT 5: INTERACTION OF SCIENCE, TECHNOLOGY AND SOCIETY

CONTENTS

1.0 INTRODUCTION

In many societies there is vast body of knwledge which in utilised for development. In this unit we want to study how science and technology interacts in modern societies.

2.0 OBJECTIVES

After successfully studying this unit you should be able to:

- State the relation between Science, Technology and Society
- Mention some qualitative changes in society due to Science and technology
- State some factors threatening societal safety and security

3.0 MAIN CONTENT

3.1 RELATIONSHIP BETWEEN SCIENCE, TECHNOLOGY AND SOCIETY

At the time of industrial revolution entrepreneurs used Scientific and technological result for the development and improvement of production for profit. New Scientific and technological results led to the creation of new industries, new science and technologies. Competition between nations became intense and focused on the important of science and technology an source of national power on economy and security. After world war II Science and technology became an intergral part of national policy.

SELF ASSESSMENT

How is the knowledge of Science, and Technology utilised in your country now?

3.2 QUALITATIVE CHANGES IN SOCIETY

Scientific and technological progress has several effects on the society. Some of the changes are as follows:

i. Materials prosperity – Since industrial revolution science and technology have shown acceleraed progress in energy, physical materials, information and communications, medicine, resulting into improvement in people's health, economic prosperity and living conveniences.

ii. Transport mode:- Progress in energy and material technology has given rise to new tranport modes, such as railways, automobile, airplane and ships.

iii. Communication – Development of telephone, radio and GSM cellular phone broaden the range of human activities and scope of human exchange.

iv. Machine tools – Large-volume production of goods and prodution of diverse types of material.

v. Medical technology – resulted in extention of peoples average life span, infant and child mortality rate reduced leading to rise in world population.

vi. Globalisation – advocacy that political policies should take worldwide issues into account before focusing on national or state.

vii. Information Technology (IT) – the internet revolution combined with computer technology led to information revolution which reduced cost; and time required for information distribution.

SELF ASSESSMENT

Trace any recent development as a result of science and technological development in your society

3.3 FACTOR THREATING SOCIETAL SAFETY AND SECURITY

Despite the advances of science and technology making life more prosperous, there are issues arising from science and technolgy progress.Some of the issues include:

i. Global warming

ii. Destruction of ozone layer

iii. Destruction of tropical forest

iv. Desertification

v. Nuclear radiations

vi. Emerging and Re – emerging infections diseases such as ebola, HIV

vii. Tsunami (Toyama 2004)

SELF ASSESSMENT

Explain any two issues threating life

4.0 CONCLUSION

Science and technology have good contribution and challenges to the society. Many believe that science and technology can be a cure for all or provide resolution for all problems

5.0 SUMMARY

Science and technology has provided service to humanity as a whole. It has contributed towards, providing a better quality of life and a sustainable and healthy environment for present and future generation. Despite all the goodies of science it has some issues threatening the safety and security of poeple. There is hope that the challenges will be addressed with fruitfull dialogue on the issues.

6.0 ASSIGNMENT

i) Trace the trend of Science and Technological development through the ages towards scietal development

ii) Identify and discuss some qualitative changes in the society brought about by science and Technology.

iii) Highlight on some safety and security challenges brought about amid the scientific advancement brought about by time.

7.0 REFERENCES/ FURTHER READING

Toyama A. (2004) changes in society due to scientific and Technological progress a white paper on Science and Technology Ministry of Eduction, Culture, Sports, Science and Technology, Japan.

MODULE II: APPLICATION OF SCIENCE AND TECHNOLOGY TO EVERYDAY LIFE.

INTRODUCTION:

Science and technology has been of great benefit to the society. Without science and technology, life in the society would not have been worthwhile. Science and technology have contributed positively to the society at the same time there are lots of negative impacts of science and technology on the society.

The concern of this module is to look at the different ways in which the society has benefited from science and the different ways it has not benefitted. This module is therefore divided into five (5) units as follows:

Unit 1: Benefits of science and technology to the society

Unit 2: Health and diseases

Unit 3: Problems related to the use of science and technology

Unit 4: Global warming

Unit 5: Desertification

UNIT 1: BENEFIT OF SCIENCE AND TECHNOLOGY TO THE SOCIETY

1.0 INTRODUTION

The concern of this unit is to look into some of the areas in which science and technology has benefited the society.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Discuss some of the ways science and technology have benefitted the development in agriculture
- List some of the contributions of science and technologyto

  -health.

  -Communication

  -Transportation
- List some house hold appliance which are products of science and technology

3.0 MAIN CONTENT

3.1 AGRICULTURE

Science and technology have contributed immensely to the development of agriculture. With the development of modern agroscience and technology:

- The traditional farming method has been replaced by modern mechanised farming.
- Improved strians of seeds are introduced. These strains can withstand the attack of viral or becteria diseases. They can grow to reach maturity within a short period in places where there is short period of rainfall; produce more yeild during harvest and are resistant to attack by pests.
- Soil quality is improved by using fertilizers
- Production of agricultural machinery, equipment, and agricultural structures.
- Animal production, including the care and processing of poultry and fish and dairy management.
- The processing of food and other agricultural and biorenewable products.

3.2 HEALTH

The most important contribution of science and technology to health is the ability to provide cures or prevention measures for the different ailments that afflict man (Nutter, 2003). Some of the contributions of science and technology to health includes;

- Discovery of complex techniques to cure previously incurable diseases
- Development of vaccines to prevent attack by some diseases like missles, small pox polio, yellow fever
- Complex surgical equipment to make previously complicated surgeries simple
- Medication for all types of diseases
- Diagnostic equipment that help in detecting diseases

- X- rays, machine, scaning machine
- Developement of genetic engineering
- Biotechnology industry

3.3 COMMUNICATION

Science and technolgy has influenced the means of communication. In the olden days messages took months to reach distance places. Messeengers and horse – riders carried messages. Now there are numerous means of communication like telephones, wireless, radios, televisions, and so on. On a telephone you can talk to your friends, relatives at a distant place in few seconds. With the help of wireless apparatus, messages may be conveyed to far off places in no time infact telecommunication has made the whole world a "global village". Radios give us news from all the corners of the world, while on the television screen you can see happings of far off lands (Nola,B;Robert,O.; Irzik, K. &Gurol, R. 2005).

3.4 TRANSPORTATION

Scinece and technology have revolutionizedthe area of transportation. In the olden days means of transportation were by trecking, and horse riding. With advent of science and technology travelling by land, using cars, buses, trains; by sea using ships and canoes, by air using aeroplanes is now very easy. Aeroplanes are the fastest means of transportation. Time and distance are no more a problem to the society becuase of the means of transportation. The world has grown smaller. The credit for all these achievements goes to science (Popper; 2002).

3.6 APPLIANCES IN THE HOMES

Science and technology have helped in the production of appliances in the homes which make life more comfortable. Some of these appliances are:

- Freezers and refrigerator which are used in the preservation of food as well as cooling drinks
- Fans, air condition used during hot season
- Room- heaters used when there is cold
- Mirco waves
- Pressure cooker

- Washing machine
- Pressing iron
- Cooking pots
- Electric kettle
- Electric cooker
- Gas cooker
- Kerosine stove

4.0 CONCLUSION

In this unit we have learnt that the benefits of Science and technology sourround us in our everday life. The clothes we wear, what we eat how we move from one area to the other, the shoe we wear, the biro we write with, everything around us are all products of Science and technology.

5.0 SUMMARY

This unit has exposed you to some of the benefits of Science and technology. It has discussed the benefits of Science and technology to the society. These benefits are seen in the areas of agriculture, health, communication, transportation, house hold appliances, industry.

6.0 TUTOR- MARKEDASSIGNMENT

1. Discussed 2 ways each in which science and technology has benefitted the society in the area of:

a) health
b) Agriculture
c) Communication

7.0 REFERENCES AND FURTHER READINGS

Nola, B.; Robert, O; Irzik, K. And Gurol, R.
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UNIT 2: HEALTH AND DISEASES

1.0 INTRODUCTION

Science and Technology have made a tremendous breakthrough in the field of medicine. The discoveries in the areas of what to use in diagnosing diseases and what to take in curing diseases to be able to maintain a good health are all to the advance in the field of science and technology. This unit therefore looks at some of the contributions of science and technologyin the area of health and diseases.

2.0 OBJECTIVES

After studying this unit, you should be able to:

1. Explain the meaning of Health and Health care
2. Discuss what is diseases and the different types of diseases
3. List some communicable diseases and their vectors
4. Mention some eminent scientist and their contributions in the field of health.
5. Explain the impact of Health information technology in th field of Medicine.

3.0 MAIN CONTENT

3.1 Meaning of Health

Health is the level of functional or metabolic effeciency of a living organism. The world Health Organisation(WHO) defined health in its broders sense in its 1948 constitution as a "state of complete physical mental, and social well- being and not merely the absence of disease or infirmity". Health today can be improved through surgery and medication, modern technologues in the prevention of disease. It is increasingly recognised that health is maintained and improved through the advancement and application of health science.

Health care scienc, is an applied science that deals with the application of science, technology, engineering and mathematics to the delivery of health care.

There are three types of health care

1. Preventive health
2. Public health
3. Curative health

The Science and act of preventing disease, prolonging life and promoting health through the organised efforts and informed choices of society, organizations, public and private, communicaties and individuals is called public health.

3.2 Meaning of Health Science

Health science is the branch of science that is focused on health. There are two main approaches to health science.

i. The study and research of the body and health related issues to understan how humans (and animals) function

ii. The application of that knowledge to improve health and to prevent and cure diseases.

Health science builds on many subjects including biology, Biochemistry, Physics, Chemistry, epidemiology, Pharmacology and Medical sociology and strives to better understand and improve human health through them.

Organized intervention to improve human health using health science are thus achieved based on principles and procedures developed through the health sciences produced by practioners trained in medicine, nursing pharmacy etc.

3.3 MEANING OF DISEASE

A disease is an abnormal pathological condition that causes pain, dysfunction, distress, social problems or death to the affected person. Diseases may be communicable or non-communicable disease.

COMMUNICABLE DISEASE(CD0

Disease transmissible, (as from person to person) by direct content with an discharges or by indirect means (as by a vector). They can be transmitted by skin contact, through body fluids, in contaminated food or drink, via airborne particles containing microrganisms. Animals or insect bites are also agents of transmission. Colds , preumonia, AIDS, Flu, hepatitis, cholera, maleria, etc are all communicable diseases

ACTIVITY: List 10 Communicable diseases and describe how they are transmitted

NON- COMMUNICABLE DISEASES(NCD)

A non- communicable disease is a medical condition or diseases that can be defined as non-infections non –transmissible among people for example hypothension, diabetics, cancer etc.

The world Health Organisation (WHO) reports non – communicable diseases to be by far the leading cause of death in the world representing over 60% of all deaths. Risk factors such as a person's background, lifestyle like smoking, sedentary life, genetics and environment are known to increase the likelyhood of certian non- comuncable diseases. Many of these diseases are also caused or exacebated by the advantages of Science and technology, like use of more refined foods and oils, increased consumption of salt, sedentary life style with excessive watching of television, use of remote controls which reduce physical activity.

3.4 IMPACT OF SCIENCE AND TECHNOLOGY ON HEALTH AND DISEASES

Science and technology has made a lot of changes and progress in the way man relates with his health and diseases. It hasprovided the basis of all researches in medicine. The impact of science and technology has made many land mark achievements in medicine e.g

- Willem J. Kolff (1950_S) a medical researcher, invented the artificial kidney dialysis machine
- Gertrude Elion (1954). Potented the leukaemia – fighting drug 6- mercaptopurine
- Herbert Boyer and Stanley Cohen (1973) invented the technique of DNA cloning which allowed genes to be transplanted between different biological species.
- Louis Pastuer proved that certian diseases are caused by infected agents, and development a vaccine for rabies.
- Robert Koch provided the study of infectious diseases with a Scientific basis which is known as Koch's postulates.

- Edward Jenner, Jonas Salk and Albert Sabin development effective vaccines for smallpox and polio.

- Alexander Flemming descovered the world's first antibiotic Penicillin

- Gerhard Domagia developmened Sulphonamides the first broad spectrum synthetic antibacteria drugs.

To a large extent, advances in science and technology have contributed to the management of non – communicable diseases like heart, and kidney transplants and dialysis, cardiac bypass surgeries, various drugs in management of cancer, diabetic cardiovascular diseases like hypentension and high cholestrol.

The develoment of drugs has led to cure of several disease conditions and improved the management of various diseases. New investigations in diagnosis of diseases, biochemical immunological and imaging techniques are evolving daily. Surgical techniques are developing through science and technology for management of various conditions e.g use in organ transplant, prothesis etc.

3.5 HEALTH INFORMATION TECHNOLOGY (HIT): The use of technology computers in information management in medicine has evolved rapidly over the years.

Advantages and Use of HIT

- Enable comprehensive databases of information to be viewed and used by authorized users when they need it and where they need it.

- Greater efficiency in accessibility of patient information

- Accessibility allows a faster transfer of medical history in a medical emergency or when visiting a new doctor, and also allows researchers and public health authorities – with the permission an consent of the patient – to efficiently collect and analyse updated patient data

- Reduce cost associated with duplicating tests

- Appointment reminder and notification of laboratory results can be handle electronically, resulting in greater efficiency and reduced human error.

- Accountability systems provide an audit trail that can help to eliminate security breaches and, at the very least, track user activites to ensure their appropriateness, authorization, and ethicality

Disadvantages of HIT:

- Possibility for mis – diagnosis due to “norms" and statistical probabilities, tendencies to rely on computer programs and tables rather than human skills.

- Privacy concerns (hacking)

4.0 CONCLUSION

In this unit you have learnt the contributions science and technology have made in the area of health and diseases.

5.0 SUMMARY

In this unit, you have been exposed to the meaning of health and diseases; the types of health care, types of diseases; and the impact of sciences and technology on health and diseases. Also some of the contributions of some Scientists were discussed as well as advantages and disadvantages of health information technology in medicine were looked at

6.0 TUTOR – MARKED ASSIGNMENT

1. List the names of 5 Scientists and their contribution to the field of medicine.

2. Decribe briefly the followings

a) Health

b)i)Communicable Diseases

ii) Non- Communicable Diseases

3. Discuss the important of Health information Technology in Medicine

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UNIT 3: PROBLEMS RELATED TO THE USE OF SCIENCE AND TECHNOLOGY

1.0 INTRODUCTION

Science and technology are weapons through which good or evil can be done depending on the conscience of those who are using it. There are lot of ways in which science and technology have been used to restore the intergrity of the environment, however, wrong use and abuse of the advantages may be disadvantageous and disastrous.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- List ways in which the use of Science and technology can be of disadvantage to the society
- List pollutants produced by human activities
- Discuss the effects of air pollution on human beings
- List major water pollutants
- List the effects of water pollutants on the environment

3.0 MAIN CONTENT

3.1 Meaning And Type of Pollution

Pollution is the introduction of conteminants into the natural environment that cause adverse change.

Types of Pollution

- Air Pollution
- Water Pollution
- Light Pollution
- Noise Pollution
- Radioactive Pollution
- Thermal Pollution
- Soil Pollution

Activity 3.1

Discuss what causes noise pollution

3.2 AIR POLLUTION

The development of Science and implementation of technology has led to the development of machines which utilize hydrocarbons as fuel and release a lot of toxic fumes into the atmosphere like car, manufacturing plants and factories and mining apparatus. The introduction of particulates, biological molecules, or other harmful materials into the earth's atmosphere result in air pollution. The effects of air pollution are felt to a large extent by the populace leading to disease, death to humans damage to other living organisms such as food crops. According to the 2014 WHO report, air pollution in 2012 caused the deaths of around 7 million people worldwide. An air pollutant is a substance in the air can have adverse effects on human and the ecosystem.

Major pollutants produced by human activity includes:

- Sulphur oxide (SO2) is produced by volcanoes and in various industrial processes. Coal and petroleum often contain sulphur compounds, and their combusion generates sulphur dioxide.

- Nitrogen oxide, particularly nitrogen dioxide, are expelled from high temperature commbustion, and are also produced during thunderstorms by electric discharge. They can be seen as a brown haze dome above or a plume downwind of cities.
- Volatile organise compounds – VOCs are well- known outdoor air pollutant. They are categorized as either methane (CH4) or non- methane (NMVOCs). Methane is an extremely efficient green house gas which contributes to enhance global warming.
- Particulates, some particulates occur naturally, originating from volcanoes, dust storms, forest and greenland fires, living vegatation, and sea spray. Human activites, such as the burning of fossil fuels in vehicles, power plants and various industrialprocesses also generate significant amounts of aerosols. Increased level of fine particles in the air are linked to health hazards such as heart disease, altered lung function and lung cancer.
- Persistent free radicals connected to airborne fine particles are linked to cardiopulmonary disease.
- Toxic metals, such as lead and mercury, especially their compounds.
- Chlorofluorocarbons (CFCs) – harmful to ozone layer; emitted from products are currently banned from use. These are gases which are released from air conditioners, refigwrators, aerosol sprays, etc. CFC's on being released into the air rises to stratosphere. Here they come in contact with other gases and damage the ozone layer. This allows harmful ultraviolet rays to reach the earth's surface. This can lead to skin cancer, disease to eye and can even cause damage to plant.
- Ammonia (NH_3)- emitted from agricultural processes. Ammonia contributes significantly to the nutritional needs of terrestial organisms by serving an a precursor to foodstuffs and fertilizers. Ammonia, either directly or indirectly, is also a building block for the synthesis of many pharmaceuticals. Although in wide use, ammonia is both caustic and hazardous. In the atmosphere, ammonia reacts with oxides of nitrogen and sulfur to from secondary particles.
- Odors – such as from garbage, sewage, and industrial processes
- Radioactive pollutants – produced by nuclear explosions, nuclear events, war explosives , and natural processes such as the radioactivity decay of radon.

Other effects of air pollution include: The incidence of asthma in children and adults are notably higher in cities especially those with air pollution problems less than rural areas. Other health problems like pnuemoconiosis and lung cancer may also develop. Mercury poisoning from induatrial gas pollution has also been documented.

3.3 WATER POLLUTION

The discharge of waste generated by human activities directly or indirectly into water bodies (e.g lakes, rivers, oceans, aquifers and groundwater) results in water pollution. The major water pollutants are sewage and toxic effiuent from indutries. It has been suggested that water pollution is the leading worldwide cause of deaths and diseases. Natural phenomena such as volcanoes, algae blooms, storms, and earthquakes also cause major changes in water quality and the ecological status of water. A major source of water pollution in Nigeria is poor sewage disposal results in run- off and point source contamination of water bodies. Contaminatants may include organic and inorganic susbtances.

Organic water pollutants include:

- Detergents
- Insecticides and herbicides, a huge range of organohalides and other chemical compounds
- Petroleum hydrocarbons, including fuels (gasoline, diesel fuel, jet fuels, and fuel oil) and lubricants (motor oil), and fuel combustion by products, from storm water runoff
- Volatile ogranic compounds, such as industrial solvents, from improper storage.
- Chlorinated solvents, which are dense non- aqueous phase liquids, may fall to the bottom of reserviors, since they don't mix well with water and are denser.
- Polychlorinated biphenly (PCBs)
- Trichloethylene
- Perchlorate
- Various chemical compound found in personal hygiene and cosmetic products
    - Drug pollutant invloving pharmaceutical drugs and their metabolites
    - Disinfection by- products found in chemically disinfected drinking water, such as chloroform
    - Food processing waste, which can include oxygen – demanding substances, fats and grease
    - In organic water pollutants include:
    - Acidity caused by industrial discharges (especially sulfur dioxide from power plants)

- Ammonia from food processing waste
- Chemical waste as industrial by – products
- Fertilizers contaning nutrients – nitrates and phosphates – which are found in storm water runoff from agriculture, as well as commercial and residents use
- Heavy metals from motor vehicles (Via urban storm water runoff) and acid mine drainage
- Silt (sediment) in runoff contruction sites, logging or land clearing sites.

Macroscopic pollutant – large visible items pollutant the water – may be termed " floatables" in an urban storm water context, or marine debris when found on the open seas, and can includes such items as:

- Trash or garbage (e.g paper, plastic or food waste) discarded by people on the ground, along with accidental or intentional dumping of rubbish, that are washed by rainfall into storm drains and eventually discharged into surface waters
- Shipwrecks, large derelict ships

EFFECTS OF WATER POLLUTANTS

The effects of water pollutant include:

- Water is rendered unsafe for consumption, leading to water scarcity,
- Water borne diseases e.g cholera, and other diarrhoeal disease
- Poisoning like mercury, arsenic
- Loss of ecological life: Planktons, fish etc.
- Worsening of poverty as people who depend on water for their livehood lose their source of income e.g fishermen

In the sourthern parts of Nigeria, oil spills from oil companies and ship are a major source of water pollution.

3.4 THERMAL POLLUTION

This is the increase of temperature caused by human activity.e.g

- Warmer lake water as a result of the use of the lake water to cool manufacturing plants
- Increased temperature in areas with lots of concrete, vehicles and air conditioners.

This results in loss of aquatic life, discomfort and disruption of plant life.

3.5 LAND POLLUTION

The degradation of the earth's surface caused by a misuse of resources and improper disposal of waste. Eg.

- Litter
- Oil spills etc

It destroys the natural habitat of animals and plants apart from creating an eyesore

3.6 OTHER PROBLEMS: thoughscience and technology is seen as the source of development of a society, it may yet be the source of problems. Apart from waste generated by science and technology other problems exists eg:

- Development in science and technology is inequitably distributed and developing countries are not catching up on beneficial global trends like agriculture and renewable energy
- As a result of soil degradation and global warming causing disrupted weather conditions, hubger and famine is persisting in several places notably sub-saharan Africa.
- Poverty persists in many places notably the developing countries
- The world is a global village as a result of information technology, however there is also the risk of spread of negative trends
- Technology has helped to produce sophisticated weapons of mass destruction

4.0 CONCLUSION

Science and technology has been benefitial to the society but at the same time the misuse or the side products of science and technology can be of disadvantage to the society.

5.0 SUMMARY

In this unit we have learnt the types of pollution and their effects

-Air pollution

-Water pollution

6.0 TUTOR – MARKED ASSIGNMENT

1. List 5 major pollutants produced by human activities

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UNIT 4: GLOBAL WARMING

1.0 INTRODUCTION

The planet earth warming is in the increase, scientists all over the world have been confirming this from their scientifc researches. Generally, and individually, human all over the world are feeling the impact of this and its impact on the change in climate conditions and its final effects on the enviroment. In this unit, you will learn about the causes of global warming, its effects on the environment and solutions to global warming

2.0 OBJECTIVES

After studying this unit, you will be able to

- Describe what global warming is
- Explain what greenhouse effects is
- List the gases which constitute greenhouse gases
- Explain what causes global warming
- Describe the impact of global warming
- Discuss different ways in which greenhouse gases can be reduced
- Discuss solutions to prevent global warming

3.0 MAIN CONTENT

3.1 Meaning of Global Warming

The term Global Warming refers to the increase in the average temperature of global surface air and oceans as a result of natural events and human activities. The term is used to describe a gradual increase in the average temperature of the Earth's atmosphere and its ocean, a change that is believed to be permanently changing the earth's climate.

3.1 Green – House Effects

The greenhouse effect is the rise in temperature on earth as certian gases in the atmostphere trap the Earth's radiated energy.

- Energy from the sun drives the Earth's waether and climate, and heats the Earth's surface.
- In turn, the Earth's radiates same energy back into space
- Some atmospheric gases(Water vapour, carbon dioxide etc.) trap some of the radiated energy, retaining heat somewhat like the glass panels of a greenhouse, hence the term " Green house effects".
- These gases are therefore refered to as greenhouse gases

The six main greenhouse gases are:

- Carbon dioxide (Co_2)
- Methane (CH_4) 20 times potent as $C0_2$
- Nitrogen (iv) oxide (N_20)
- Hydrogenfluorocarbons (HFC_S) industrial gas
- Perfluorocarbons(PFC_2) Industrial gas
- Sulpur hexafluoride (SF_6) industrial gas
- Water vapour (H_20) (Houghton & Ding 2001)

Most of global warming is being caused by increasing concentrations of greenhouse gases produced by human activities. Most of these gases come from the combustion of fossil fuels

in car, factories and electricity production. Carbon dioxide is the gas most responsible for global warming.

Different greenhouse gases have different heat – trapping abilities. A molecule of methane produced more than 20 times the warming of molecule of carbon dioxide. Nitrogen (IV) oxide has 300times more heat – trapping abilities than CO_2, While the fluorocarbons (HFC_S, PFC_O, SF_6) have heat – trapping potentials thousands of times greater than CO_2

Greenhouse gases (GHG_S)in the atomsphere are like a blanket that keeps the earth warm. This protective blanket helps make the planet habitable. But over the past 200years, humans have greatly increased the level of GHG_s in the atmosphere by burning fossil fuels like oil and coal. This is like throwing on a second blanket, causing tempareture to rise (United Nations Environmental Programme, UNEP, 2010).

In a similar way, greenhouse gases are essential for the planet, as many of these gases are actually life – enabling, for without them, heat would escape into space and the earth's average temperature would be a lot colder. However, if the greenhouse effects becomes stronger, then more heat gets trapped, than needed, and the earth becomes less habitable for humans, plants and animals (UNEP. 2010).

3.3 Causes of Global Warming

The major cause of global warming is an increase in the amount of longlived greenhouse gases in the earth's atmosphere. Carbon dioxide is the major cause, as we burn fossil fuels like coal, oil, and natural gas for energy, or create postures and plantation, carbon dioxide accumulates and overloads the atmosphere.

Certain waste management and agricultural practices aggravate the problem by releasing other potent global warming gases, such as methane and nitrogen (iv) oxide.

3.4 Impacts of Global Warming

The problems of global warming is making hot days hotter, rainfall and flooding heaveir, hurricanes stronger and droughts more severe. This intensification of weather and climate extremes is the most visible impact of global warming in our everday lifes. It

also causes dangerous changes to the landscape of the world, adding stress to wildlife species and their habitat (Meyer, 2010)

The effects of an increase in global temperature include a rise in sea levels and change in the amount and pattern of precipatation, as well as a probable expeansion of susbtropial desserts. Other likely effects of the warming include more frequent extreme weather events including heat, waves, drought and heavy rainfall, ocean acidification, and species extinctions due to shifting temperature regimes. Effects significant to humans include the threat to food security from decreasing crop yields and the loss of habitat.

Karl & Hassel (2009) summarises

The impact of Global warming as follows:

- Rapid changes in global temperature
- Extreme weather patterns
- Extreme weather events on the increase
- Ecosystem Impacts
- Habitat Inundation
- Increase in pest and diseases
- Failing agricultural output
- Increase in would hunger

Activity:

Discuss the different ways in which extreme waether pattern will affect the society

3.5 Solution to Global Warming

The major problem of Global Warming is the heat trapping by the greenhouse gases in the atmosphere. The following techniques and approaches are needed to bring down the emission of these greehouse gases (West 2010)

6. **Boosting Energy Effeciency**

The energy used to power, heat and cool homes, businesses and industries is the single largest contributor to global warming. Increase in energy efficency must be seen as a crucial part of reducing carbondioxide emissions and minimising depependence on fossil fuels.

7. **Renewable Energy**

Renewable energy sources such as from water, wind solar biomass, geothermal are available around the world will play a key role in replacing the world dependence on fossil fuel based energy source such as coal, oil and nature gas which are non – renewable and are the causes of emission of greenhouse gases.

8. **Managing Forest by Preventing**

Deforestation and encouraging planting of trees i.e afforestation reduce waste.

The production of garbage contributes to global warming both directly and indirectly. decomposing wastes in landfills produces methane and other greenhouse gases. Recycline of wastes like metals, plastics, glass and paper lowers greenhouse gas emission since recycled items take far less energy to manufacture than items produced from scratch.

9. Greening Transportation

Emission of Carbon dioxide from vehicles is at a faster rate. Reducing the numbers of vehicles on the roads by using mass transportating system, using low-carbon fuels will deliver huge results.

4.0 CONCLUSION

In this unit you learnt about one of the problems that is affecting the enviroment and hence the humanlife; the Global Warming. As an intergrated science teacher you need to educate the puplis you will be teaching to have a knowledge of what it is and how to avoid activities that will aggrevate it.

5.0 SUMMARY

In this unit you learnt the meaning of global warming; the causes of global warming which is as a result of forces caused by human activities in his quest for energy for industrial and agricultural practices. The production of greenhouse gases using

greenhouse effect and problems caused by global warming are discussed and solutions to prevents the problems are given.

6.0 TUTOR – MARKED ASSIGNMENT

1. Briefly explain the meaning of Global warming

2. Discribe what "Greenhouse" effect is and list the gases which constitute Greenhouse Gases.

3. What are the causes of global Warming

4. Global warming has lots of effects on the society. Discuss these effects and the way out.

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UNIT 5: DEFORESTATION

1.0 INTRODUCTION

With the world growing at a pace hard to match, the increasing need for space is turning out to be an area of concern. With desperate need for land for agricultural, industrial and most importantly urban needs to contain cities and their growing population, a direct action that we have come to recognize as "Deforestation" occurs. Deforestation in simple term means the felling and clearing of forest cover or tree plantations in order to accommodate agricultural, industrial or urban use. It involves permanent end of forest cover to make that land available for residential, commercial or industrial purpose.

Over the last century the forest cover around the globe has been greatly compromised, leaving the green cover down to an all-time low of about 30 per cent. According to the United Nations Food and Agriculture Organization (FAO), an estimated 18 million acres (7.3 million hectares) of forest are lost each year.

2.0 OBJECTIVES

At the endofthis unit, you should be able to:

- Define Deforestation
- State and explain the causes of Deforestation
- Outline the effects of Deforestation
- Proffer solutions to Deforestation

3.0 MAIN CONTENT

3.1· Definition of Deforestation

Deforestation in simple term means the felling and clearing of forest cover or tree plantations in order to accommodate agricultural, industrial or urban use. It involves permanent end of forest cover to make that land available for residential, commercial or industrial purpose.

Deforestation can also be defined as clearing of virgin forests, or intentional destruction or removal of trees and other vegetation for agricultural, commercial, housing, or firewood use without replanting (reforesting) and without allowing time for the forest to regenerate itself.

Deforestation according to Cambridge Dictionaries simply means the cutting down of trees in a large area, or the destruction of forests by people. It is destroying large areas of tropical rain forest.

3.2 Causes of Deforestation

There are so many causes of Deforestation. The following are some of the identified causes of Deforestation, viz:

- Fire.
- Commercial Agriculture
- Cattle Ranching
- Palm oil production
- Subsistence Farming
- Logging for Timber
- Mining
- Infrastructure Building
- Charcoal Production
- Firewood Collection

Fire

Forest fires release greenhouse gases like carbon dioxide and clouds of soot that can disrupt normalrainfall patterns, although natural fires have always played a part regenerating forest soils and vegetation it rarely result in permanent deforestation of an area.

However, the spread of agriculture, poor logging practices and urban expansion make forests more vulnerable to uncontrolled fires that result in forest degradation.

Commercial Agriculture

Commercial agriculture is the largest driver of deforestation, involving forest clearing for cropland, pasture and tree plantation.

It has been forecast that sugarcane and soya alone will be responsible for a 20 million hectare expansion of agricultural land in Brazil over the next 40 years (more than twice the size of Hungary). (Source: Reuters)

Cattle Ranching

Rising living standards worldwide have increased local and global demand for meat, driving deforestation as ranchers and agriculture businesses demand grazing pasture and also land to grow feed for livestock (such as soybean).

Brazil has become one of the largest exporters of beef in the world. According to the Global Canopy Programme, 75% of deforestation in Brazil is linked to the cattle industry, with the cattle herd in the Amazon growing by 140% from 1990 to 2003. (Source: Reuters)

Palm oil Production

Soaringglobal demand for palm oil as a cheap raw material for products ranging from cooking oil, margarine, cereals, and baked goods to soaps and cosmetics has led to Indonesia having some of the highest rates of deforestation in the world. Plantations have been financed by the sale of timber from cleared forests.

Indonesia and Malaysia supply the vast majority of the world's palm oil, although plantations are now also springing up in parts of Africa. Palm oil grown on cleared peat lands and turned into biofuels has a carbon footprint five times as big as diesel, reports the Global Canopy Programme. (Source: Reuters)

Subsistence Farming

Farming by smallholders is related to about 33% of deforestation and deforestation in Africa is still largely driven by small-scale subsistence farming.

Deforestation is driven by cultivation of staple crops like maize, manioc, rice and small-scale cultivation of cash crops like coffee, cocoa, and cotton while forest degradation occurs when livestock are grazed in wooded areas. (Source: Reuters)

Logging for Timber

Legal arid illegal loggings are major causes of forest degradation, accounting for more than 70% of total forest degradation in Latin America and Asia. In Brazil and Indonesia, some 80 to

90 percent of timber extraction is deemed illegal.

According to the WWF, up to 28 percent of the EU's timber imports could be illegal. Well-regulated, selective logging, however, need not trigger deforestation. Expanding plantation forestry can also provide an alternative to illegal timber. (Source: Reuters)

Mining

Many forested areas are rich in minerals and therefore vulnerable to deforestation. The Congo Basin, for instance, contains vast untapped reserves of gold, coltan (used in mobile phones), diamonds, uranium, manganese, and copper.

Mining accounts for about 7% of deforestation in developing nations with Asia and Africa more affected than Latin America. Apart from clearing trees to make way for the mine itself, mining may also use sizeable amounts of timber or charcoal, contributing to forest degradation through direct use and localized population expansion (Source: Reuters)

Infrastructure Building

Infrastructure projects such as roads are linked to about 10% of total deforestation in the developing world.

Road construction perhaps contributes the most to eventual levels of deforestation and degradation because roads encourage urbanization (itself responsible for a further 10% of deforestation) and the spread of agriculture into forests, particularly in remote areas where property rights are unclear or poorly regulated. (Source: Reuters)

Charcoal Production

Charcoal production primarily occurs in the forests of sub-Saharan Africa, where poverty drives many to cut down trees for fuel for cooking. Charcoal production is one of the two main drivers of forest degradation in Africa. Together with fuelwood collection it accounts for about 48% of degradation. Charcoal made from old-growth hardwood trees is the most valuable because it burns hotter and longer. (Source: Reuters)

Firewood Collection

Firewood collection and charcoal production are the largest drivers of forest degradation in Africa, together linked to about 48% of total degradation.

Together with population growth and rapid urban expansion, this can have a devastating effect on forests in poor countries. Wood meets 80 percent of all the Democratic Republic of Congo's energy needs and has been the main cause of deforestation in the area. In Sudan's Darfur region

a sudden influx of refugees had a catastrophic effect on local forests according to the UN. (Source: Reuters)

3.3 Effects of Deforestation

The following are some of the effects of Deforestation:

1. Climate imbalance: Deforestation also affects the climate in more than one way. Treesrelease water vapor in the air, which is compromised with the lack of trees. Trees also provide the required shade that keeps the soil moist. This leads to the imbalance in the atmospheric temperature further making conditions for the ecology difficult. Flora and fauna across the world are accustomed to their habitat. This haphazard clearance of forests has forced several of these animals to shift from their native environment. Due to this several species are finding it difficult to survive or adapt to new habitats.

2. Increase in Global Warming: Trees playa major role in controlling global warming. The trees utilize the greenhouse gases, restoring the balance in the atmosphere. With constant deforestation the ratio of greenhouse gases in the atmosphere has increased, adding to our global warming woes.

3. Soil Erosion: Also due to the shade of trees the soil remains moist. With the clearance of tree cover, the soil is directly exposed to the sun, making it dry.

4. Floods: When it rains, trees absorb and store large amount of water with the help of their roots. When they are cut down, the flow of water is disrupted and leads to floods in some areas and droughts in other.

5. Wildlife extinction: Due to massive felling down of trees, various species of animals are lost. They lose their habitat and forced to move to new location. Some of them are even pushed to extinction. Our world has lost so many species of plants and animals in last couple of decades.

3.4 Solutions to Deforestation

1. The best solution to deforestation is to curb the felling of trees, by employing a series of rules and laws to govern it. Deforestation in the current scenario may have reduced however it would be too early to assume. The money-churner that forest resources can be is tempting enough for deforestation to continue.

2. Clear cutting of forests must be banned. This will curb total depletion of the forest cover. It is a practical solution and is very feasible.

3. Land skinned of its tree cover for urban settlements should be urged to plant trees in the

vicinity and replace the cut trees. Also the cutting must be replaced by planting young trees to replace the older ones that were cut. Trees are being planted under several initiatives every year, but they still don't match the numbers of the ones we've already lost.

4.0 CONCLUSION

Deforestation can also be seen as removal of forests leading to several imbalances ecologically and environmentally. What make deforestation alarming are the immediate and long term effects it is bound to inflict if continued at the current pace. Some predictions state that the rain forests of the world will be destroyed completely if deforestation continues at its current pace.

Deforestation or clearance occurs due to several reasons, to get an overview we could include the need of money, both in terms of profitability as well as providing for one's family in most scenarios, along with lack of or no forest laws, need for land space for housing etc among a long list of other uses. Mainly blamed on agricultural or pastoral use, farmers fell trees for increasing space for cultivation and/or as fodder land for grazing and surviving livestock. The whole concept of 'slash and burn' agriculture is used to indicate this same process where farmers employ the above chain of actions for their purposes.

Deforestation has reached an alarming rate in many countries around the world but three areas hit the most by deforestation are Amazon rainforest, Africa, and Indonesia. In these three areas condition is no longer just alarming, it hasreacheda critical zone. Deforestation is oneof the biggest environmental evils that have happened on this planet, and if current trends continue with somewhere around 16 million hectares of forests disappearing each year, our planet will head into an environmental disaster in years to come.

About half of the forests that once covered the earth are already gone, and we are definitely not doing enough to protect the ones that remain. Our forests and rainforests mean so much to us but most people still do not understand how important forests really are. What we definitely need is a very quick solution to stop deforestation. This solution maybe forests funding, or something else but the forests must be saved.

5.0 SUMMARY

In this unit, we have learnt that:

1. Deforestation simply means the felling and clearing of forest cover or tree plantations in order to accommodate agricultural, industrial or urban use. It involves a permanent end of forest cover to make that land available for residential, commercial or industrial

purpose.

2. Fire, commercial Agriculture, Cattle ranching amongst others are causes of Deforestation
3. Some of the major effects of Deforestation are climate imbalance, global warming, soil erosion, floods and wild life extinction
4. Deforestation could be curbed by banning of clear cutting of trees among others.

6.0 TUTOR MARKED ASSIGNMENT

a. What do you understand by the term Deforestation
b. List and explain 7 causes of Deforestation
c. Can we say that Deforestation has any effect on the environment? If yes discuss, if no prove your answer with reasons
d. What will you suggest to environmentalists as ways of curbing Deforestation?

7.0 References/ Further readings

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MODULE III: SCIENCE, TECHNOLOGY, SOCIETY AND EMERGING ISSUES

INTRODUCTION

Science-technology-society touches on many issues that are important in our everyday life. Some of these issues are discussed under this module.

The module is divided into five (5) modules as follows:

Unit 1: Sourcesof Energy

Unit 2: Basic scientific principles involved in the design and functioning of everyday appliances

Unit 3: Socio-political aspects of science and technology

Unit 4: Environmental education

Unit 5: Science Education and Science-technology-society

UNIT 1: SOURCES OF ENERGY

1.0 INTRODUCTION

In the unit you will be intorduced to the concept of energy, and the different forms of energy. We use energy in our everyday life to do work. Some energy sources are renewable while some are non- renewable. All these concepts will be looked into in this unit.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Explain the concept of energy
- List the different forms of energy
- Describe the different types of energy sources
- List the advantages and disadvantages. Of the different types of energy sources
- Advance reasons why there should be conversation of energy.

3.1 MEANING OF ENERGY

Energy exists freely in nature. It is one of natural resources on earth. Some of them exist infinitely (never runout; called RENEWABLE), the rest have finite amounts (they took millions of years to form, and will run out oneday; called NON- RENEWABLE).

In a layman's terms, energy is the amount of force or power when applied which can move one object from one posistion to another. It is the capicity of a system to do work. Energy

exists in everybody whether they are human beings or animals or non- living things e.g jet, machines etc.

FORMS OF ENERGY

Energy can have many forms. The different forms of energy are:

Kinetic Energy

Potential Energy

Light Energy

Sound Energy

Gravitational Energy

Elastic Energy

Electromagnetic Energy

Nuclear Energy

Heat Energy

According to the law of conservation of energy, any form of energy can be converted into another form and the total energy will remain the same. For example, a laborer, when he pushes a pile ofbags, his potential energy stored inside him is converted into kinetic energy. When a wood is burnt, its chemical energy is converted into heat energy. When you charge your mobile phone, the electrical energy is converted into the chemical energy which is stored inside the battery's molecules.

Activity 4:1

Give an illustration of how one form of energy can be converted into another

3.2 RENEWABLE ENERGY

Renewable energy is the energy which is generated from natural sources i.e sun wind, rain, tides and can be generated again and again as and when required. It cannot be depleted. They are available in abundance and by far they are the cleanest sources of energy available on this planet.

Renewable energy resources are

1. Hydropower, tidal power and wave power energies generated by the movement of water
2. Wind and radiant energy from geothermal heat (used for geothermal power)
3. Solar energy from the sun. The supply of solar energy is an inexaustible energy resorce in relation to human time scales.

- The potential wave energy on coast lines can provide 1/5 of world demand.
- Hydroelectric power can supply 1/3 of total global energy needs
- Geothermal energy can provide 1.5 more times the energy needed globally
- There is enough wind to power the planet 30times over, wind power could power all of humanity's needs alone
- Solar power can supply humanity's need4,000 times over, but currently only about 0.1% world energy needs is being supplied by solar.

ADVANTAGES OF RENEWABLE ENERGY SOURCES

1. The sun, wind, geothermal, ocean energy are availble in abundat qualitity and are free to be used
2. Renewable energy sources have low carbon emissions, therefore they are considered as green and enviromental friendly
3. Renewable energy sources help in stimulating the economy, and creating job opportunites
4. You don't have to rely on any third country for the supply of renewable sources
5. Renewable sources can cost less than comsuming the local electricity supply

DISADVANTAGES OF RENEWABLE ENERGY SOURCES

1. It is not easy to set up a pant as the initial costs are quite high.
2. Solar energy can be used during the day time and not during night or raining season
3. Geothermal energy which can be used to generate electricity has side effects as it can bring toxic chemicals beneath the earth surface onto the top and create enviromental changes.Also it releases carbon monoxide in the air, which combines with oxygen, thus reducing the percentage of oxygen in the area. Carbon monoxide has the capability to suffocate as it deprives oxygen from its surroundings to form carbon dioxide
4. Hydroelectirc sources provide pure forms of energy but building dams across the rivers which is quite expensive can affect natural flow and affect wild life.
5. To use wind energy requires strong winds, therefore suitable sites to operate them has to be located. They can affect bird population as they are quite high

Activity 4.2

What is a renewable energy resource

3.3 NON – RENEWABLE ENERGY RESOURCE

This is also called FINITE RESOURCE. This is a resource that does not renew itself at a sufficient rate for sustainable economic extraction in meaningful human time–frames. An example is carbon– based organically – derived fuel. The original organic material, with the aid of heat and pressure, becomes a fuel such oil or gas. Examples are fossil fuels (such as coal, petroluem, and natural gas) and uranium. Fossil fuels are mainly made up of carbon. Fossil fuels were formed over 300 million years ago, when the earth was a lot different in its landscape. It had swampy forests and very shallow seas. This time is referred to as " CARBONIFEOUS PERIOD".

Caol : Most power stations on earth require huge reserves of coal to produce electricity continuously without break. When coal is burnt, it produces heat that is used to convert the water to steam. The steam is then used to move the turbines which produces electricity. Coal contains excessive amount of carbon. When it is burnt to produce power, it combines with oxygen to produced carbon dioxide which is one of the gas responsible for global warming.

Oil: Wide usage of oil related products has resulted in massive AIR POLLUTION.

Oil is a major source of fuel that is used in vehicles. Due to the process of combustion, harmful gases like carbon dioxde are released into the atmosphere when oil is burnt. Oil is transported from one nation to the other using pipeline or ships. Bursting of the pipelines or leakage in ships lead to oil spill which affect both animals and plants that are inside or around the sea.

Naural Gas: Natural gas is a mixture of gases including methane, ethane, propane and butane. They burn completely in oxygen and leave no ashes with the release of energy. It causes no pollution and is one of the cleanest form of fossil fuel.

Nuclear Energy: Nuclear power plants use Uranium as a fuel as a source of energy. The energy can be released either through nuclear fission or nuclear fusion. Nuclear fission is the most used to produce nuclear energy.

U- 235 element is bombaded with slow moving neutrons which break the atom and releases energy. The atoms that got split are then again hit by other neutrons to produce mass amount of

energy. Nuclear power does not produce any greenhouse emissions, but produces some sort of nuclear wastes called RADIOACTIVE ELEMENTS. These elements emit strong radiation that can affect human life.

ADVANTAGES OF NON- RENEWABLE ENERGY SOURCES

They are relatively cheap and easy to use. They are less expensive to produce, and can be converted from one form of energy to the other. For example, small amount of nuclear energy can be used to produce large amount of power.

DISADVANTAGES OF NON- RENEWABLE ENERGY SOURCES

- They will expire oneday because of the rate at which they are being used, and this may affect their prices.
- Fossil fuels are made up mainly of carbon. When they are burnt in air, they produce a lot of carbon compounds (carbondioxide and other greenhouse gases) which are the major causes of global warming. Air, water and land pollution are all consequences of using fossil fuels.
- Also radioactive elements have terrible effects on human lifes.

3.4 ENERGY CONSERVATION

Energy needs to be conserved to protect the enviroment from drastic changes, to save the depleting resources for future generation. The rate at which the energy is being produced and consumed can damage the world in many ways. Energy conservation will help to save the environment. It is important to realise how energy is useful to us and howwe can prevent it from being wasted.

Energy conservation therefore refers to reducing energy consumption through using less of an energy service. It differs from efficient energy use, which refers to using less energy for a constant service. For example, driving less is an example of energy conservation. Driving the same amount with a higher mileage vehicles is an example of energy efficiency. Both are energy reduction techniques, and hence a way of conserving energy.

Energy conservation will result in increased enviromental quality, personal financial security and higher savings. It will also lower energy costs by preventing future resource depletion.

ACIVITY 4.3

Differentiate between energy conservation and energy efficiency.

4.0 CONCLUSION

This unit exposed you to the sources of energy and why some are renewable and cannot be exhausted and others are non- renewable and can be exhausted.

5.0 SUMMARY

In this unit, we have learnt that there are different sources of energy. The non-renewable sources are cheap but they can depleted with time and cause serious problems to the enviroment. While the renewable energy source cannot be depleted and has the capacity to produce more energy. At present because of the cost of its operation, not much of it is being utilised.

6.0 TUTOR – MARKED ASSIGNMENTS

1. a) Explain the meaning of energy
   b) List 5 examples of the way we utilise energy in our everyday life
2. Why is energy from sun regarded as renewable and fossil fuels regarded as non- renewable.

7.0 REFERENCES / FURTHER READINGS

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UNIT 2: BASIC SCIENTIFIC PRINCIPLES INVOLVED IN THE DESIGN AND FUNCTION OF EVERDAY APPLIANCES

1.0 Introdcution

Every device or appliance you are using has some scientific principles on which it was designed to function appropreatly. In this unit some of the principles for the design of some common deviced will be studied

2.0 Objectives

After studying this unit carefully you are expected to be able to:

- State and explain scientific working principle of electrically powered devices
- State and explain the principles of refrigration

3.0 Main Content

3.1 THE PRINCIPLES OF ELECTROMAGNETISM

Almost all electrically powered devices we use such as generator, motors, fans, microware oven and many others use principles of electromagnetism in their design and function. Electromagnetism is the branch of science that deals with electricity and magnetism and the interaction between them.

a) One of the basic laws of electromagnetism is the Faraday's law of induction. According to this theory, electric and magnetic fields could be converted into one another with a relative motion of a magnet and conducting coil. Faraday discovered that moving a magnet near a wire induces an electric current in that wire

b) Orsted found that electric current creates a magnetic field

c) Another importantsfact found is that when a straight conductor carrying currents is palced in a magnetic field, a mechanical force is created on the conductor which makes it move. The magnetic flux, the current and the force created are mutually prependicular to the each other. The direction of the three variables could be determined using the right rule. The right law/rule is explained as follows:

If we place the thumb and first two fingers of the right hand so that they are all at right angles to one another:

Fore finger points to the direction of magnetic field

Thumb points to the direction of motion

Second finger points to the direction of current of (electro-magnetic force) e.m.f

d) It was also found that a combination of two out of the three phenomena above (flux, current and motion) generate the third phenomena

i. Conductor with current in a magnetic field generates force of movement. This is the principles of design and function of any electrical motor you know, such as grinding machine, electric fan etc.

ii. A conductor forced to move in a magnetic field generates electricity. This is the principles of design and operation of any electricity generating plant.

SELF ASSESSMENT

What is Faraday's law about electricity?

3. 2 PRINCIPLES OF REFRIGRATION

Refrigeration is a process in which work is done to move heat from one location to another. The work of heat transfer or cooling is traditionally driven by mechanical work, but can also be done by using electricity through a machine called refrigrator.

i. When petrol drops on your palm what do you feel?

ii. Give reason on what you feel in.

When ever a volatile liquid drops on any surface, the liquid molecules will want to escape into air (Vaporise). The liquid molecules will require some energy to vaporise. The liquid will search round for some heat from the environment to be able to vaporise. The molecule will collect all available heat on the surface it drops to be able to escape. Where the heat is removed the area becomes cold. This shows that evaporation causes cooling , this theory of evaporation causes cooling is the basis for designing and functioning of refrigrators, freezer and in local pot we use in keeping water for cooling.

In the refrigrator, there is a liquid which is made to want to evaporate. Before the liquid particles evaporates it sources for heat energy from its enviroment. The evaporating liquid will absorb the heat around to make the sorrounding area cold. This phenomena of evaporation requires the absorbtion of heat from the enviroment is the theory and principles for the design of refrigrator. Evaporation thus causes cooling.

SELF ASSESSMENT

Explain how evaporation takes place.

4.0 CONCLUSION

Electromagnetic laws are the basic for the design of motors and electric generators. Evaration requires some energy to occur which causes cooling.

5.0 SUMMARY

-Faraday discovered that movement of a magnet towards or away from a magnet induces electrical current. These electromagnetic theories form the basic for the desiging of electrically powered appliances

-It was also observed that a conductor containing eletric current placed in a magnetic field experiences a mechanical force which makes it more.

-Evaporation causes cooling in the principles for the design of a refrigrator and freezers.

6.0 ASSIGNMENT

Identify the working principles of the cellular phone you have.

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UNIT 3:SOCIO – POLITICAL ASPECTS OF SCIENCE AND TECHNOLOGY

CONTENTS

1.0 INTRODUCTION

Science, politics and war can be regarded as social activities undertaken by human beings who make up the society. There is interaction between science, politics and war. The results of such interaction lead to current issues and clashes between the three. The scientists are employed by the state (politics), to research and find out the best way of solving societal problems. Often the scientists pass their findings to the technologists who put them into usable forms; some of which could be weapons of war. Funding of what the scientist does is by the government and the impact of what the scientist does is on the society.

2.0 Objectives

After studying this unit, you should be able to

- Explain what politics is
- Explain what is war
- List the different ways in which politics affects the development of science
- List the different ways development in science is affected by war.
- Give examples of weapons of war

3.0 MAIN CONTENTS

3.1 Science and politics

Politics is the process by which a group of people make decision. It consists of social relations involving authority and power.

- **Issues on Science and politics**

  Nationsthe world over pay particular attention to science and technology to improve their level of scientific and technological development by making efforts to produce the manpower that can efficiently and successfully apply the capabilities of science and technology to the development of its people and the quality of life of her citizens.It is on this basis that a country is adjudged to be scientifically and technologically developed. It is the level of development that has given rise to the classification of the nations of the world into the first, second and third world countries. Nigeria falls in the group of the third world country.

- **Social Economic forces**

  The scientific and technological strength of a nation have bearing on the level of support the scientist receive from the government and private organization in terms of funding most super powers like the United State, Great Britain spend large proportion of their budgets on Scientific researchers and applications.

- **Public Policy and Science Development**

Many Governments of nations make policies that they feel can enhance the wellbeing of the people they govern. For example, in the education sector, considering the importance attached to science and technology, policies are made to encourage students to study Science. Sometimes the Government intentionally publishes false or misleading scientific information to down play the seriousness of certain issues.

- **Racism and Science Development**

  Racism is a factor that has affected the growth and development of Science. Sometimes important research findings have been suppressed simply because it is coming from Africa.

3.2 Science And War

Hornby (2006) defined war as a state of opened, declared armed hostile conflict between states or nations. It is one of the outcome of issues in politics and also one of the

negative effects of Science and technology. Wars are fought by using weapons developed using the knowledge of Science and technology. Fundings of the researches for the production of weapons are being provided by the government.

Effect of war on the development of Science and Technology

1. Research Findings

A large fraction of funding for science is for the purpose of war. Because of this, many research areas and application of science are oriented to war.

2. Direction of technological change

War influences not only specific scientific projects but also the whole direction of technological innovation.

3. Criteria for important scientific problems

Due to the high degree of military funding for science and the military influence on the direction of technological innovation, what are seen as improtant scientific can become oriented to military interests. For example, nuclear physics, genetic engineering and plasma physics hold part of their prestige to their potential role in war.

- **Effects of Modern War on Society**

Modern wars are more deadly and destructive. They work havoc on an alarming large scale. The loss of life and property is so enormous.

Weapons of War

Science and technology has developed new and horible weapons which has changed the way war is being fought.

List of Weapons of War

- Chemical and Biological
- Nuclear
- Atomic bomb
- Rockets
- Missiles
- Hydrogen bomb
- Guns

Activity 3: Desribe the operation of one of the weapon listed?

4.0 Conclusion

This unit examined the ways politics and war have affected the development of Science and technology. The growth and development of Science and technology in any society depend on the support received from the government of the day, and the type of policies been made.

5.0 Summary

In this unit, you learnt that: politics and war affects the development of science and technology. The different ways include:

- Government providing funds for scientifics and technological researches.
- Government support for the type of research in Science
- Policies in support of Science study in Schools.

6.0 Tutor – Marked Assignment

Discuss different ways in which the development of Science and technology has been affected by politics and War.

7.0 REFERENCE / FURTHER READINGS

Hornby A.S. (2006). Oxford Advanced
Learner's Dictionary New 7th Edition University Press.

UNIT4: ENVIROMENTAL EDUCATION

CONTENTS

1.0 INTRODUCTION

This is an outlook on Science education that emphasizes the teaching of scientific and technological development in their cultural, economic, social and political contexts. It originates from the STS movement in Science Education. In this view of Science Education, students are encourage to engage in issues pertaining to the impact of Science on their everyday life and make responsible decision about how to address such issues.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- Explain the meaning of environmental education
- Discuss the need to include environmental education in the school curriculum
- Outline the historical development of environmental education
- List principles of environmental education

3.0 MAIN CONTENTS

3.1 Meaning of Environmental Education

Environmental Education (EE) can be defined as an organised effort to teach about how natural environments function and, particularly, how human being can manage their behaviour and ecosystems in order to live sustainably (Bortosh 2003). According to UNESCO, Tbilisi Declaration, (1978) EE is a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitude, motivations, and commitment to make informed decision and take responsible action. It is a form of Science, Technology, Society (STS) education, but places greater emphasis on the enviromental consequences of scientific and technology developments.

3.2 Historical Development of Enviromental Education

The historical development of environmental Education can be divided into 3 major periods.

First Period: Nature study Movement, from late 19th century. The nature study movement used tables and moral lessons top help students develop an appreciation of nature and embrace the natural world.

Second Period: Conservation Education Moverment: 1920 – 1930

This emerged as a result of the Great Depression during the 1920s and 1930s. Conversatismeducation dealt with the nature world in a drastically different way from Nature study because it focused on rigorous Scientific training rather than natural history. It was a major Scientific management and planning tool that helped solve social, economic, and Environmental problems.

Third Period Modern EnvironmentalEducation movement late 1960s to early 1970s: This stems from Nature study and ConservartismEducation. Oil spills in the 1960s and early effects of air pollution seen in the United States and Europe, coupled with worries about nuclear war and the effects of radiation fallout, helped to push the

modern environmental education moverment forward (Venlataraman2008). Ultimately on April 22, 1970 a national teach – in about environmental problems paved the way for the modern Environmental Education Movement. Later that same year, President Nixon passed the National Environmental Education Act, which was intended to incorporate Environmental Education into K- 12 Schools then, in 1971, the National Association to improve environmental literacy by providing resources to teachers and promoting environmental education programs.

Internationally, Environmental Education gained recognition when the United Nation conference on the Human Environment decleared that environmental education must be used as tool to address global enviromental problems. The United Nations Education Scientific and Culture Organization (UNESCO) and United Nations Environment Programm (UNEP) created three major declarations that have guided the course of environmental education.

1. S**TOCKHOLM DECLARATION JUNE 5-16, 1992**

The Declaration of the United Nation Conference on the Human Environment. The document was made up 26 principles to inspire and guide the people of the world in the preservation and enhancement of the human environment.

2. **BELGRADE CHARTER October 13- 22, 1975**

This was built upon the stockholm declaration and adds, goals, objectives, and guiding principles of environmental education programmes. It defines an audience for environmental educational which includes the public.

3. THILISI DECLARATION October 14 – 26, 1977

This Declaration noted the important role of environmental education in the preservation and improvement of the world's environment, as well as in the sound and balanced development of the world's communites. The conference laid out the role, objectives, and characteristic of enviromental education and provided several goals and principles for environmental education.

ENVIRONMENTAL EDUCATION IN NIGERIA

Environmental Education did not make much impact in Nigeria until the incident of koko toxic waste which occured in Ondo State in 1988 (Obeka, 2009). The Nigerian Conversation Fund(NCF), a non-governmental organisation, succeeded through its programme in sensitizing the federal Government to the introduction of Conservation Education at all levels of the education systems. In 1992, the federal Government directed its agency, the Nigerian Education Research and Development Council (NERDC), to infuse environmental education elements into the curriculum of primary and Secondary Schools. (Adebayo &Olawepo 1997). The National Curriculum Conference on Environmental Education held in Calaber in September 1996 fashioned out an acceptable enviromental education curriculum for the nation's institution of higher learning (Obeka, 2008)

3.3 Objective of Environmental Education

The National Envvironment Education curriculum Development and published by Nigerian Education Research and Development Council (1998) for all categories of learner has the following major objectives:

- Acquiring knowledge and understanding of the environment and sensitivity to total enviroment and its allied problems and humanity's responsible presence and role in it.
- Developing skills in investigating and evaluating ecological, political, economic, social, aesthetic and educational factors for solving environmental problems.
- Developing attitudes, values and strong feelings concern for the environment and the motivation for active participation in its protection and improvement.

3.4 Component of Environmental Education

According to Obeka(2008), Environmental Education has five major component parts namely.

- Awareness and sensitivity to the environment and environmental challenges.
- Knowledge and the understanding of the environmental challenges.
- Attitude of concern for the environment and motivation to improve or maintain environmental quality
- Skills to identify and help resolve environmental challenges.
- Participation in activities that lead to the resolution of environmental challenges.

3.5 Principles of Environmental Education

i. Environmental Education must involve everyone, government, indusrty, the media as well as individuals.

ii. Environmental Education must be life long information about environmental problems

iii. Environmental Education must be holistic and about connection. In order to address environmental challenges, people need to think broadly and understand system, connections; patterns and causes

iv. Environmental Education should be taught as a subject

v. Environmental Education must be practical not only the theory aspect

vi. Environmental Education must lead into actions which result in better environmental outcomes not simple accumulation of inert knwoledge or skills that are not practicable.

vii. Environmental Education must be in harmony with social and economic goals.

viii. Environmental Education should provide people with knwoledge, understanding and capacity to influence mainstream society in a way which progresses environemntal objectives along with other legitimate social and economic objectives.

4.0 CONCLUSION

The need for Environmental Education in the schools cannot be overemphasized. The natural environment has been facing lots of problems which are due to human activities. The need therefore arises to consider educating the members of the society. This way, the children will become informed and concerned adults in the society who will be better manegers of the environment.

5.0 SUMMARY

In this unit, we have learnt:

1. The meaning of Environmental Education
2. The historical development of Environmental Education.
3. The objectives, components of Environmental Education and its Principles.

6.0 TUTOR – MARKED ASSIGNMENTS

1. Discuss the rational for the inclusion of Environmental Education in the school curriculum.

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UNIT 5: SCIENCE EDUCATION AND SCIENCE – TECHNOLOGY – SOCIETY (STS)

1.0 INTRODUCTION

The need to make science taught in the classroom relevant to the needs of society, thus making the society to be sceintifically and technologically literate is one of the aims of science education. Teaching society using (STS) approach is one of the ways science can be taught in the classroom to produce not only scientifically and technologically literate society but also potential scientific manpower.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Explain the meaning of science education
- State the major aims of science education
- Describe what STS approach to teaching science is
- Describe what it is to be scientifically literate
- List characteristics of a scientifically literate person.

3.0 MAIN CONTENT

3.1 NATIONAL POLICY ON EDUCATION AND SCIENCE EDUCATION

In Nigeria's Philosophy of education (2004) it is believed that:

a) education is an instrument for national development. To this end, the formulation of ideas, their intergration for national development, and the interaction of persons and ideas are all aspects of education;
b) education fosters the worth and development of the individual, for each individuals sake, and for the general development of the society.

To this end, school programmes should be relevant, practical and comprehensive. To this end, according to national policy on education (FMN 2004), it is expected that science education shall emphasise the teaching and learning of science processes and principles. The goals of science education therefore shall be to:

i) cultivate inquiring, knowing and rational mind for the conduct of good life and democracy;
ii) produce scientists for national development;
iii) service studies in technology and the cause of technological development;and
iv) provide knowledge and understanding of the complexity of the physical world, the forms and the conduct of life.

3.2 MEANING OF SCIENCE EDUCATION

Ogunniyi (1986) defined science education as a field of study concerned with producing a scientifically literate society. Also it lays the foundation for future work in science and science related fields by aquainting the students with certain basic skills and attitudes.

Aims of Science Education

According to him, science education has two basic aims:

1) the production of a scientifically literate society
2) the development of potential scientific and technological mapower. That is, training the young members of a society in such a way that a large number of them can take up future careers in science and technology.

To achieve these aims the way science is taught in the classroom is very important. STS approach to the teaching of science lays emphasis on the way science is taught such that the students acquire these aims.

3.3 SCIENCE – TECHNOLOGY – SOCIETY (STS) APPROACH TO SCIENCE TEACHING

Science – Technology and Society approach is the teaching and learning of science in the context of human experience. It is the teaching of science via the "application of issues" first approach. In other words, the STS teacher starts with the applications of such concepts or real issues or relavant questions and ideas as advanced organizes, which provide linkages and connections to the concepts for the student. This way, science is related to the society for the students and science instruction made current and part of the real world of the student. For example in teaching the topic RUSTING, the teacher could start with the problem of rusting which leads to the concepts. This will help the students comprehend and appreciate the problem of rusting.

Using (STS) approach in teaching science will help in producing a scientifically literate society

Activity: Choose a topic in Biology and decribe how you will teach it using STS approach

SCIENCE LITERACY

According to the United States National Center for Education statisitc, "Scientific literacy is the knowledge and understanding of science concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity"

The Organisation for Economic Cooperation and Development (OECD) (2003) sees scientifc literacy as the capacity to use scientific knowledge, to identify questions and to draw evidence – based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human acitivity.

A person who is scientifically and technologically literate is a person who can function within a society as a whole, rather than simply as a scientist in the workplace (UNESCO, 1993). Scientific literacy relates to enabling citizens to effectively participate

in the real world. It is a movement that gives less attention to possession of conceptual understanding of pure science abstract ideas and emphasizes more the ability to make decisions relating to the technological applications of scientific ideas, of socio- scientific issues facing society. These are being recognised as crucial learning comportents. (Shamos 1995).

As pact of the Science – Technology – Society (STS) moverment, the NSTA (1991)suggested that a scientifically and technologically literate person needs four attributes

1) Intellectual (High Order Thinking Skills)
2) Attitudinal
3) Societal
4) Interdisciplinary

Hence according to Norris & Philips (2003) scientific literacy can be used to include the followings

a. Knowledge of the substantive content of science and ability to distinguish fromnon-science

b. Understanding science and its implications
c. Knowledge of what counts as science
d. Independence in learning science
e. Ability to think scientifically
f. Ability to use scientific knowledge in problem – solving
g. Knowledge needed for intelligent participation in science – based issues
h. Understanding the nature of science including its relationship with culture
i. Appreciation of and comfort with science, including its wonder and curiosity
j. Knowledge of the risks and benefits of science; and
k. Ability to think critically about science and to deal with scientific enterprise.

It can be seen from the above list that scientific literacy involves much more then the mere acquisition of the scientific knowledge. It also entails a process of making science as a way of living and behaving

3.4 GOALS OF SCIENTIFIC AND ETCHNOLOGICAL LITERACY

The goals of scientific literacy according to Yager (1992) is to develop in the citizenery the abilites to use concept from science and ethical values in solving everday problems and making responsible decisions in everyday life, including work and leisure. That is:

- Engage in responsible personal and civic actions after weighing the possible consequences of alternate options.
- Distinguihing between scientific evidence and personal opinion and between reliable and unreliable information
- defend decisions and actions using rational arguments based on evidence
- Remain open to new evidence and tentativeness of scientific knowledge.
- Value scientific research and technology problem solving
- Offer explanation of natural phanomena which may be tested for their validity
- Locate, collect, analyze and evaluate source of scientific and technological information
- Use these source in solving problems making and taking actions

3.5 PROMOTING SCIENTIFIC AND TECHNOLOGICAL LITERACY

In order to help fill the growing need for scientifically and technologically literate society, it is important to stimulate interest in science and technology knwoledge at an early age.

In Africa, response to the development of scientific and technological capacities has been through the introduction of science curriculum and technical vocational education curriculum in the national education system. While primary and secondary education levels have often been responsible for laying the foundation in science and technology and providing apportunities for awareness creation and exploration higher education institutions ahve been responsible for training and producing middle and higher level scientific and technological manpower for national development.

Nigeria has Ministry of Science and Technology with the mandate to promote scientific and technological growth.

Beyond formal education, science and technology can be learnt through the media many of us depend on the news media to keep abreast of advances and breathroughs, to explain the science behind eruption volcanoes or the engineering invloved in containing massive oil spills.

3.6 IMPORTANCE OF SCIENTIFIC LITERACY

There are a number of reasons why scientific and technological literacy is important. The society we live in depends on technology and the scientific knowledge that makes it possible. Therefore

- Science and technology under our economy, our ability to support our growing population, and new developments to keep us healthy and our military strong is needed.
- The future of the youths depends on their knowledge of science and technology in a world where employers seek well – educated, well – rounded individuals in the engineers, doctors etc. There is the need for scientific literacy.
- Our ability to survive as a species depends on understanding the threats to our ecosystem and the choices we make to miligate these threats e.g global warming, desertification, deforestation , pollution and many more requires the need for scientific literacy.

4.0 CONCLUSION

Scientific and technological literacy is a must for science education. Science education must try to address the appreciation of the nature of science and the relevance of the science being aquired. That is enhancing scientific literacy through science education by using appropriate approach of teaching science in the classroom hence the Science – Technology – Society (STS) approach.

5.0 SUMMARY

In this unit you have learnt the aims of science education as it is stipulated in the national policy on education. Also Science- Technology – Society (STS) approach of teaching science in the classroom is looked at; and the end product of which is sceintific and technological literacy is discussed. The meaning, goals, and importance of scientific literacy are discussed as well as ways of promoting scientific and technological literacy

6.0 TUTOR – MARKED – ASSIGNMENT

1. State two major aims of science education

2. What is STS approach to the teaching of Science?

3. Describe what it is to be scientifically literate

4. List 4 characteristic of a scientifically literate person

5. Science education in Nigeria should help the learner to relate the science he learns at school with his cultural way of viewing the world. Discuss this statement

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