EFFECTS OF "ABEGA" AND "RAOIN" MODELS ON STUDENTS' ACADEMIC ACHIEVEMENT IN ENVIRONMENTAL EDUCATION IN SCHOOLS OF NURSING, ZARIA, NIGERIA

S. S. Obeka[1]

[1]Geographical and Environmental Education ,Department of Science Education Ahmadu Bello University, Zaria

Abstract

The study investigates the effects of "ABEGA" and "RAOIN" models on students' academic achievement in traditional concepts of environmental education in schools of nursing, Zaria Nigeria. The study made use of two hundred (200) students from school of Nursing ABU Zaria and School of Nursing Wussasa – Zaria. Radioactivity and radiation concepts were used in the teaching. Two research questions and one hypothesis guided the conduct of this research exercise. The quasi-experimental non-equivalent control group, pre test – post test study was designed to determine the efficacy of "ABEGA AND RAOIN" models on students achievement in radiation concepts. Achievement test was used as instrument for data collection in experimental I&II ("ABEGA" AND "RAOIN" MODELS), lectures was used as control. The instrument (ERAT) was validated by two experts of Science Education, A.B.U Zaria. An item analysis was done with item difficulty level of 0.30 and 0.70 and item discrimination index of 0.22 and 1.00. The study revealed that Instructional model I and II yielded better achievement gains in environmental health education programmes than lecture. It also reveals that male students did better academically than the female students. It is recommended that environmental health education programme should be introduced in secondary and tertiary institutions and teachers should be encouraged on the use of modern techniques of instructions.

Key words: ABEGA, RAOIN, Nursing, environmental education

1. Introduction

Science and Technology Education (STE) play a significant role in the development of scientifically literate citizen in our society. It is therefore imperative that science and technology education should be appreciated from conceptual and instructional values by literate citizens. Such values according to STAN (2000) are either intrinsic (i.e. by virtue of its very native) or extrinsic (i.e. externally or traceable to it from its effect). In either case, such values help to define the objectives of the S and T.E programme with the aim of:

- Solving our economic and social problems
- Acquisition of relevant concepts and processes of scientifically literate society which is a prerequisite for national development given that we live in a world ruled by science and technological advancement.
- Improving the society through increasing the efficacy of both science and technology education and fostering international relations.
- Contribute to improving man's living conditions generally and improvement in environmental health education through the acquisition of appropriate concepts and instructional skills.

In order to appreciate Science and Technology Education better, the National science teachers Association of the United States of America, as cited in Yagar (1993) identified some features of science and technology education to include the following.

- Students identification of problems with local interest and impacts
- The use of local resources and materials to locate information that can be used to solve environmental problems.
- The active involvement of students in seeking information that can be applied to real life problem solving.
- The extension of learning outcomes beyond the class to global environment.
- A focus on the impact of science and technology on the individual students.
- A view on the development of science and technology education content and concepts.
- An emphasis on acquisition of science process skills to solve environmental problems.
- Emphasis on career awareness and opportunities for students to act in their environment as they attempt to resolve indentified say to day problems of life. (Yagar, 1993).

The development of Environmental Health Education Curriculum of Science and Technology Education in schools require awareness programmes for primary, secondary and tertiary levels. According to STAN (2000), S.T.S curriculum at these levels include the followings:

2.1 STE at the primary level

At the primary school level, some STE topics are embedded in some themes of the core curriculum for primary science. These are:

Theme	Topic
Exploring the Environment	The Child is part of the environment Erosion Pollution Exploitation of natural resources Conservation practices - natural resources, energy use, recycling Fertilizing the soil Garbage and sewage disposal Drainage and irrigation
Using the Senses	Sorting of common objects by smell
Bulb and Battery	Lighting torch bulbs Conductors and insulators Simple electric circuits Uses of switch and fuse in everyday life Common uses of electricity in everyday life (domestic, commercial and industrial).
Sound	Making flutes or string instruments with local materials
Magnetism	Uses of magnets
Our Earth and Our Sky Technology	Earth's movement and its effects Local examples of things and practices we do to make work easier Identification of simple machines and tools
Heat Energy and Temperature	Uses of heat in everyday life Uses of Thermometers - domestic, industrial and commercial
Soap and Alkali	Making soap with local materials Uses of soap
Water	Uses of water at home Water cycle
Common Foods	Common f3ods eaten at home Uses of food Balanced diet
Simple Machines	Uses of levers, pulleys and inclined plane Useful and harmful effects of friction in everyday life
Health & Safety	Keeping the surroundings. clean Good personal health habits Keeping safe at home, at school and along the road Simple first aid on how to clean wounds, stop bleeding, dress wounds, treat stings, bites from snakes, dog, scorpion and wasp. How to tell when you must see the doctor How to carry out artificial respiration.
Housing and Clothing	Need for houses Need for clothing
Farm Animals	Rearing chicken

2.2 STE at the Secondary level

At the secondary level of education, STE is not taught as a separate subject. STS topics are included in the Core Curriculum for Integrated Science. Details are as follows:

Unit	Topic
Living Things	Identifying self as a living thing Human intelligence shown by his/her organisation, problem solving skill, etc.
Feeding	Keeping teeth clean
Excretory System	Excreta are poisonous Need for excretion
Respiratory system	Problems connected with breathing
	Need for respiration
Circulatory System	Blood defects or diseases
Nervous System	Types of eye defects and their correction with glasses/lenses
Reproductive System	Reproduction and family tree
	Changes that accompany puberty in boys and girls
Health	Good health, its maintenance and for growth Keeping fit through good exercise, good diet, good hygiene
	Drug abuse
	Improving personal cleanliness
	Polluted water in the home
	Polluted air in the home
	Dirty environment and the home
Child's Growth and development	Factors that affect growth – food diseases hereditary factors
Energy and Appliances in the home	Use of Energy in the home
Continuity of the Family	Number and extended of Dominant and recessive traits in successive generations
Ecology	Transfer of energy from the non - living to the living world by green pts Food chain and food webs
Resources from Living	Cash crops, livestock, fishery, diary products
Components of the Environment	
Observing samples of non-living Things	Limitation of out senses Use of devices to aid senses
Water	Purification and uses Soft anti hard water
Man in space	Climate and seasons Space travel Gravitational pull
Pure and Impure stances	Salt from sea water Petroleum refining
Rusting	Conditions necessary for rusting
Acids, Bases and salts	Acids in nature
Energy Conversion and Transfer	Echoes and vibrations, noise, music
Science-Related Occupations	Farming, fishing, carpentry, engineering , medicine
Force	Friction in use
	Advantages of friction
	Effects of force
Maintenance of Machines	Importance of regular maintenance of machines
	Need for reducing friction in machines Uses. of grease, oil, ball bearing to reduce friction
Environmental Sanitation	Disposal of refuse in villages and towns Compost
	Sewage Flush toilets
Disease Vectors	Mosquito and housefly Use of insecticides
	River blindness, sleeping sickness, and malaria
Preventive Medicine	Clean water - cholera, diarrhea, typhoid
	Immunization - vaccination, inoculation
Wildlife Conservation	Man's activities and Wildlife preservation
Pollutants	Air borne solid and gaseous pollutants
	Pollutants from home and industry
	Replanting our forests
Erosion	Causes of erosion and prevention of erosion
Oil Spillage and Burning of Natural Gas Resources	Effect of oil spillage and burning of natural gas in a riverine environment
Deterioration of the Environment Due to Human activities	Our disappearing forests Encroaching deserts Other fue1

Cooking

2.3 STE at the Tertiary Level

At the tertiary level, there are components of STE in some general courses in Universities, Polytechnics and Colleges of Education. However, at the postgraduate level, some Universities offer courses on STE. The exact content varies from one University to another. However, the following content areas may be deduced.

(a) Introduction to STE

- Dimensions of science: The Historical (history of science), the sociological (Sociology Science), the psychological (psychology q science), and the Philosophical (the epistemology and linguistics of science).
- Overview of interaction of science-technology-society.

(b) Developments in Science, Technology and Society

- Science and human goals - Basic needs
- Mechanization and automation at home and industry:
- Developments in science-technology-society.
- Materials & Manufacture: (1) Natural Substances (proteins, carbohydrates, natural rubber, wood, fibres-cotton, wool, silk); (2) synthetic products (plastics, synthetic fibres, synthetic rubber, synthetic fuel, etc.); (3) petrochemicals, (4) Synthetic foods. (5) biotechnology and genetic engineering.
- Communications & transportation
- Weather and Climate: Meteorology and human activities.

(c) Science-Technology and Organization of Family and Social Life

- Effects of science & technology on human Social environment; Sciencetechnologjca1 developments & consequences for social systems: Food, sexuality, and survival; population problem, its contextual variables, consequences, controls & checks; biology of affluence: the urban ecosystem.
- War and peace: science & technology and weapons of war: biological, chemical, and nuclear (physical) warfare.
- The present and future problems of science and technology: (i) Natural resources - use and misuse; (ii) pollution of air, water, and food; (iii) space explorations and consequences; (iv) (iv) Conservation - renewable and non-renewable resources, limits of growth, energy (fuel) and power for the future; (v) biological engineering genetic engineering, cloning, test-tube babies, eugenics, euthenics, etc.
- Adjusting to technological changes

(d) Scientists and Public Affairs

- Science-Technology policies: National International priorities in science technology for developing countries. problem of resources (human and material) allocation to science and technology government. Administrative structures. Science technology and government.
- Promotion of science and technology in Nigeria: Science as a social institution. The learned societies. The government & scientific-technological developments – Research institutes.

- Promotion of science and technology in Africa.
- The social responsibility of scientists and technologists.

(e) Research in STE

According to the International Dictionary of education, ( ) research is the systematic investigation to increase knowledge and/or understanding Obeka (2011). Research in STE, understandably, has a short history and provides an interface between research in the sciences and research in social sciences. This is because research in STE deals with both science and human beings. In Nigeria, few studies on STE have been carried out:

Consequent studies in various concepts in Science and Technology Education (S.T.E) are necessary to enlighten and educate the populace on recent trends in S.T.E. A study on radioactivity and radiation concepts model involve some Environmental Health Education Concepts. (Alpha (A), Beta (BE), and Gemma (GA) = "ABEGA" model and Radiation model (Radiation and Radio therapy (RA) and Conization Radiation (10N) = "RAOIN" model). Hence the world "ABEGA" and "RAOIN" are acronyms derived from the environmental health education concepts of study.

The word Radioactivity refers to the particles which are emited from nuclei as a result of nuclear instability. Because the nucleus experiences the intense conflict between the two strongest forces in nature, it should not be surprising that there are many nuclear Isotopes which are unstable and emit some kind of radiation. The most common types of radiation are alpha, beta and gamma radioactivity (Osein, et al, 2007).

Historically, the products of radioactivity were called alpha, beta and gamma when it was found that they could be analyzed into three district species by either a magnetic field or an electric field (Lawrence, 2008).

Alpha radioactivity is compose to the protons and two neutrons. The alpha particles is a nucleus of the element helium. Because of its very large mass (more than 700 times the mass of beta particle and its change, it has a very short range hence, it is not suitable for, radiation therapy since its range is less than a tenth of millimeter inside the body. Its main radiation hazard comes when it is ingested to the body. It has great destructive power within its short range. In contact with fast-growing membranes and living cells, it is positioned for maximum damage. The alpha particle is the nucleus of the helium atom and is the nucleus of highest stability (Noda, et al 2009).

Bête Join later Gamma ray emission on the other hand usually occurs with α and $\pi^{1/}{}_{2}$ emission. Gamma rays have no charge or mass, so their emission doesn't change the chemical composition of the atom. Instead, it result in a loss of radiant energy. Gamma ray emission occurs because the nucleus often unstable after α and $\pi^{1/}{}_{2}$ decay. There are cases where pure Gamma emission occurs and this is where an Isotope exists in two forms (Nuclear Isomers). They have the same atomic and mass numbers, but have different nuclear energy content. So gamma emission occurs when the Isomer goes from a higher to a lower energy form. The Isotope protactinium – 234 exists in two different energy states and it emits rays when undergoing transition to the lower energy state.

Radiation and Radiation Therapy of Environmental Health education are crucial concepts of day to day living in our contemporary society. Radiation is a process in which energetic particles or energy or waves travel through a medium or space. There are two types of radiation (Ionizing and non-Ionizing). Ionizing – having sufficient energy to ionize an atom and non – ionizing: as radio waves or visible light). The energy radiates or travels outward in straight lines in all directions from its source. Both cognizing and non-ionizing radiation can be harmful to organisms and can result in changes to the national environment.

Nevertheless, radiation can be useful in medicine, in communication and in science. In medicine radiation and radioactive substances are used for diagnosis, treatment and research. X – ray for example pass through muscles and other soft tissues but are stopped by dense materials. This property of X – rays enables doctors to find broken bones and to locate cancers that might be growing in the body. Doctors also find certain diseases by injecting a radioactive substance and monitoring the radiation given off as the substance moves through the body. Radiation used for cancer treatment is called ionizing radiation because it forms ions in the cells of the tissues. It passes through as it dislodges electrons from atoms. This can kill cells or change genes so that cells cannot grow. Other forms of radiation such as radio waves, micro – waves and light waves are called non-ionizing. They don't have much energy and are not able to ionize cells.

In communication, all modern communication systems use forms of electro-magnetic radiation. Variations in the intensity of the radiation represent changes in the sound, pictures or information being transmitted. For example, human voice can be sent as a radio wave or micro-waves by making the wave vary to correspond variations in the voice.

In science too, researchers use radioactive atoms to determine the age of materials that were once part of a living organism. The age of such materials can be estimated by measuring the amount of radioactive carbon they contain in a process called radio carbon dating. Environmental scientists use radioactive atoms known as tracer atoms to identify the pathway taken by pollutants through the environment.

Radiation is also used to determine the composition of materials in a process called neutron activation analysis. In this process scientist is bombard a sample of a substance with particles called neutrons. Some of the atoms in the sample absorb neutrons and become radioactive. The scientists can identify the elements in the sample by studying the emitted radiation.

Radiation therapy is relevant in detecting and killing cancerous cells in the body. Radiation therapy uses high energy radiation to shrink tumors and kill cancer cells. X – rays, gamma rays and charged particles are types of radiation used for this purpose. The radiation may be delivered by a machine outside the body (external bean radiation therapy) or it may become from radioactive material placed in the body near cancer cells (internal radiation therapy) (http://www.cancer.gov/cancertopics/factsheet/therapy/radiation).

Consequently, toward improving teaching and learning in environmental health education concepts of radiation therapy, doctors and other researchers are conducting research studies to examine effectiveness of instructional techniques in this subject area. This study therefore is one of such contribution to knowledge

The objectives of the study are to: examine the efficacy of "ABEGA" and "RAON" instructional models on students' understanding of radiation concepts of environmental health education, and examine the effects of the models on the achievement scores of male and female students exposed to environmental health education achievement test.

The following research questions guided the conduct of this study:

1. Is there any difference in the academic achievement of students exposed to environmental health education achievement test and those not exposed?
2. What is the relative difference in academic achievement by gender in experimental class ABEGA and RAOIN (I & II) and lecture class when students were exposed to environmental health education achievement test?

The hypothesis posited is that there is no significant difference in academic achievement of students taught Environmental Health Education Concepts using models and those taught using lecture.

3. Materials and Methods

The study was a quasi: - experimental with a non-equivalent control group design involving three groups namely: "ABEGA" Model, "RAOIN" Model and lecture (control). Two schools were selected in Zaria Metropolis namely: Ahmadu Bello University (ABU) School of Nursing, and St. Luke Anglican School of Nursing Wussasa – Zaria. Two hundred sample population of the students were used. Environmental Concepts Achievement Test (ECAT) was used as instrument for the study.

Reliability of the instrument was established using Kudder Richardson formula with r-value of 0.92. The instrument Environmental radiation Achievement Test (ERAT) was validated by three expert of Science Education ABU Zaria. Two research questions and a hypothesis guided the study. Mean, Standard Deviation and analysis of covariance (ANCOVA) were used to analyze the data at 0.05 level of significance.

4. Presentation and discussion of Result

Table 1: Mean Achievement scores of students exposed to Environmental Health Education Achievement Test (EHAT).

Instructional techniques	N	Mean $\overline{X}$	Standard deviation (SD)
Exp 1	67	48.23	9.54
Exp 2	67	45.20	11.62
Lecture	66	41.09	12.01

Table 2: Mean achievement scores of students by gender in experiment I and II and lecture Groups.

Instructional techniques	N	Gender	N	Mean $(\overline{X})$	Standard deviation (SD)
		Male	30	46.40	3.30
Exp 1	67	Female	37	42.23	3.32
		Male	30	40.20	3.38
Exp 2	67	Female	37	38.40	3.48
		Male	30	30.20	3.67
Control	66	Female 36	36	28.47	4.75

Table 3: Environmental Health Achievement Test (EHAT) Analysis of Covariance of Students post Achievement Scores.

Sources of variation	Sum of squares	Df	Mean score	f-value	Significant at P
Covariate	10142.450	1	10442.456	132.299	.000
Pre-achievement	10142.450	1	10442.450	132.247	.000
Main effect	2517.139	3	839.130	109.45	.000
Treatment	2446.690	2	1223.347	15.957	
Gender	42.828	1	42.828	.559	.000
2 – ways interaction	9.135	2	4.571	.060	.945
Treatment – X	9.155	2	4.577	.060	.945

Explained	12668.996	6	2111.499	27	.000
Ragidual	36866.185	22	76.664	545	-
Total	**29535.181**	**22**	**130.687**	**-**	**-**

Source: Author's analysis.

The result in table 1 reveals that experimental I model group of instruction achieved statistically better result follow by experiment 2 and lastly lecture group with mean scores of 48.23, 45. 20 and 41.09 respectively. The result in table 2 indicate that males in experiment group 1, Exp groups 2 and control group did better academically, than female when they were taught with environmental health education concepts of radiation model "ABEGA" and "RAOIN" models.

Table 3 showed p-value ratio for the effect of treatment on the students Cognitive achievement in environmental Health Education Concepts of Radiation to be beyond 0.05 level of significance.

Thus, the Null hypothesis was rejected and alternative accepted that significant difference exist in academic achievement of students exposed to models of instruction in some environmental Health education concepts of radioactivity and radiation.

5. Summary and recommendations

The study established that a study on radiation concepts using "ABEGA" and "RAON" models of instruction in environmental education amongst school of nursing students in Zaria yielded positive academic achievement by gender. Literatures reviewed also showed that radiation, use of models and radio-therapy are relevant concepts in educating the child. The study is therefore quite relevant in science and technology education, hence should be encouraged at all levels of education.

From the findings of this study, the following recommendations were made:

1. That the use of new models of instruction should be encouraged in higher institutions by National University Commission, National Board for Technical Education and other agencies responsible for education.
2. Seminar, conferences and workshops should be organized by education and medical stakeholders on the utility value of current models.
3. Conducive teaching and learning environment should be created by all educational administrators to reduce gender inequality noticeable in academic achievements.

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APPENDIX I

Alpha, Betta and Gama Radioactivity

Fig I: Alpha Radioactivity

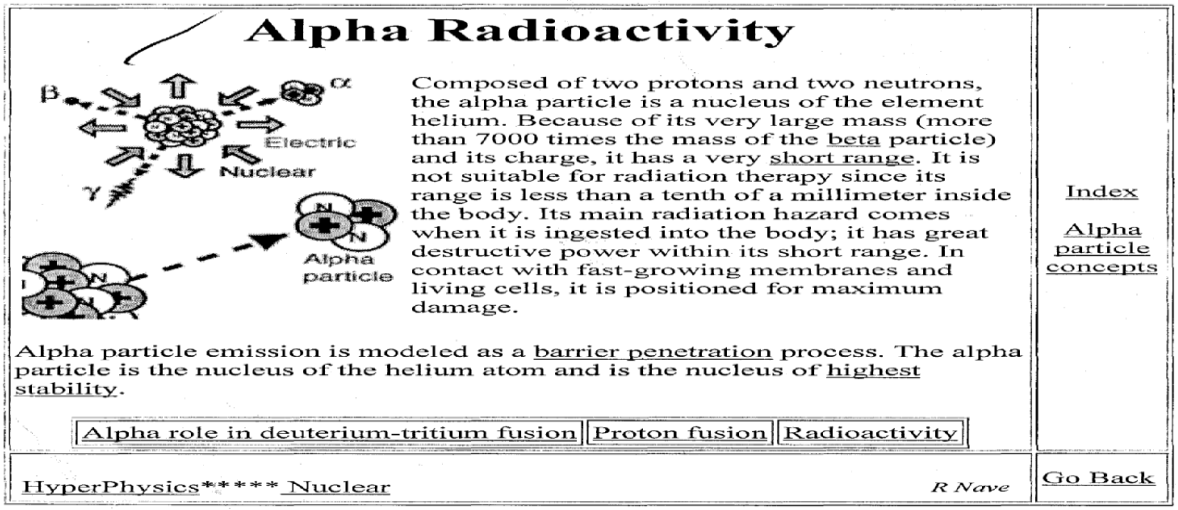


Fig. II: Alpha Binding Energy

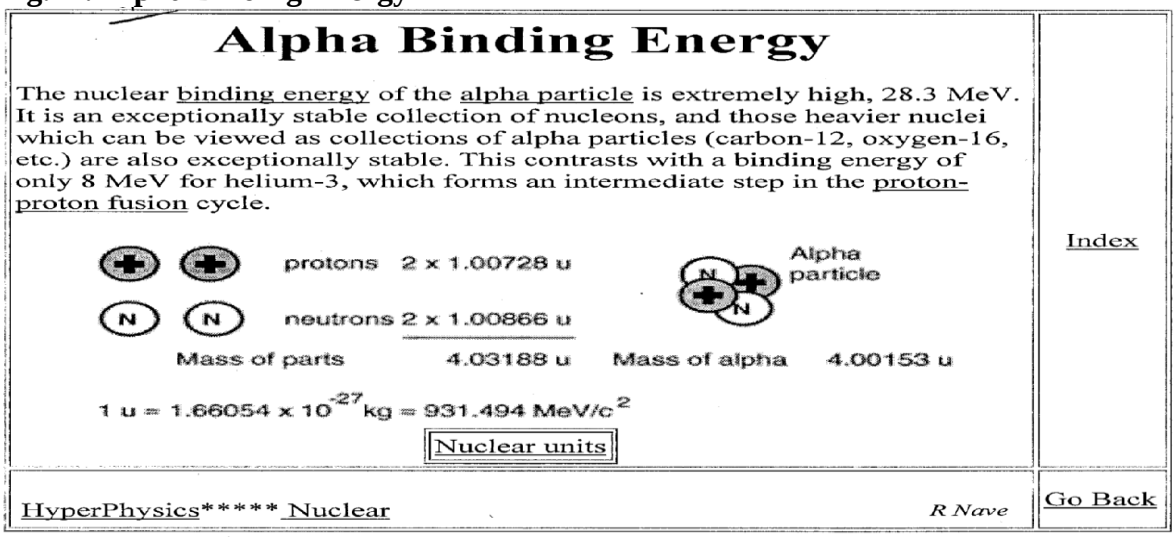
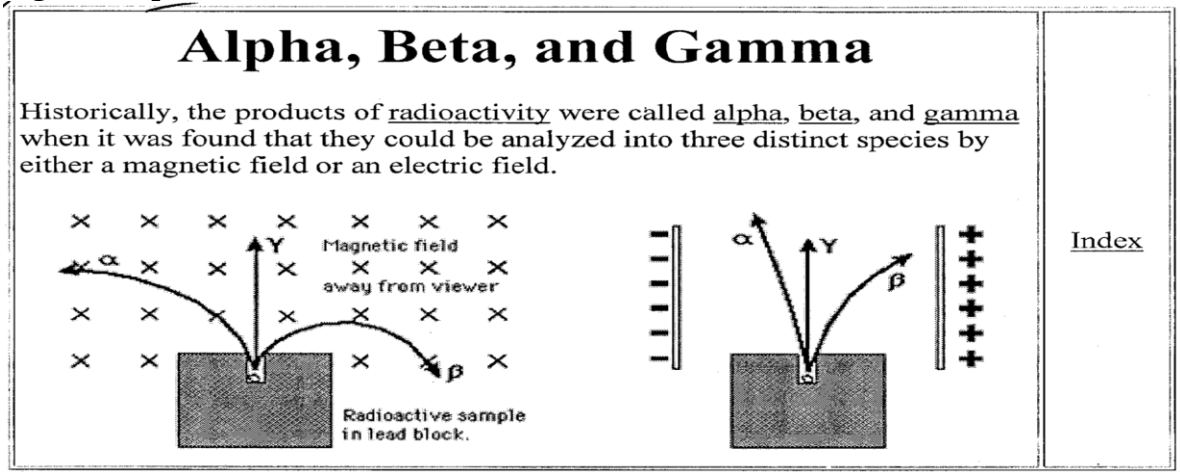


Fig. III: Alpha, Beta, and Gamma



Source: (http://e.wikipedia.org/wiki/Radiation) and Source: (http://lib:thinkquest.org/17940/test/radioactivity/htm)