COURSE GUIDE

SED 315
NIGERIAN PRIMARY/SECONDARY SCHOOL SCIENCE/MATHEMATICS CURRICULA

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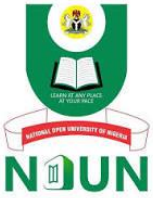

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First Printed 2015

Reviewed 2022

ISBN: 978-058-890-6

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INTRODUCTION

The Course Guide provides a brief description of the course, the course materials to be used by you and how to make use of the materials. Some general guidelines for the time you will likely require to spend on each unit of the course are stated in order to complete it successfully. Similarly, some guidance on your tutor–marked assignments are provided. Detailed information on tutor–marked assignments will be made available to you on a separate Assignment File.

WHAT YOU WILL LEARN IN THIS COURSE

This course is to intimate Science and Mathematics teachers at both primary and secondary school levels with information related to the subjects' curricula. As such the overall aim of SED 315 (The Nigerian Primary and Secondary School Science/Mathematics Curricula) is to introduce you to the objectives of primary/secondary school science/mathematics curricula, the organisation of each curriculum, suggestions on methods of treatment as well as treatment of selected topics and activities. You will as well be taken through the implementation of the curriculum by way of evaluation.

COURSE AIM

The aim of this course is to get you propelled towards implementing the science/mathematics curricula at the primary/secondary school levels. Effort is made in this regard to:

- introduce you to the objectives of science/mathematics curricula at the primary/secondary school levels
- help you to develop the skills required in organizing each curriculum
- state a number of methods of treatment
- guide you to treat selected topics and activities
- develop the rudiments of implementing the curriculum.

COURSE OBJECTIVES

In order to accomplish the aims stated above, the course proposes overall objectives. Each unit provides specific learning outcomes foremost at the beginning. It might be expedient that you refer to them in the course of treating a unit to ascertain your progress.

Listed below is a set of the general objectives of the course.

It is expected that having successfully completed the course, you will be able to:

- outline the objectives of primary/secondary school science/mathematics curricula
- describe how science/mathematics curriculum is organised
- suggest treatment method for primary/secondary school science/mathematics curricula
- give a plan for the treatment of selected topics and activities
- provide evaluation formalities for primary/secondary school science/mathematics curricula.

WORKING THROUGH THE COURSE

For you to complete this course, you need to read through each unit of this study material in addition to other relevant materials, which may be provided by the National Open University of Nigeria. Each unit provides self-assessment exercises for this course and at interval of time in the course you would be required to submit tutor-marked assignments for assessment purposes. At the end of the course, there is a final examination. The course is planned in such a way as to span through a total of 17 weeks to complete. All the components of the course are listed below; so also, you will find what you have to do and how you should allocate your time to each unit in order to complete the course on time and successfully.

Be advised that you avail yourself the opportunity of attending the tutorial sessions at the appropriate time where you will have the opportunity of comparing knowledge with your peers.

THE COURSE MATERIALS

Major components of the course are:

1. The Course Guide
2. Study Units
3. References
4. Assignments
5. Presentation Schedule.

STUDY UNITS

There are 13 study units listed under three modules in this course. They are as follows:

Module 1 The Objectives of Primary and Secondary Schools Science and Mathematics Curricula

Unit 1 Educational Objectives
Unit 2 The objectives of primary school Science/Mathematics curricula
Unit 3 The objectives of junior secondary school Science/Mathematics curricula
Unit 4 The objectives of senior secondary school Science/Mathematics curricula

Module 2 Organisation of Primary/Secondary School Science/Mathematics Curricula

Unit 1 Organisation of Curriculum
Unit 2 Organisation of Primary School Science/Mathematics Curriculum
Unit 3 Organisation of Junior Secondary School Science/Mathematics Curriculum
Unit 4 Organisation of Senior Secondary School Science/Mathematics Curriculum

Module 3 Treatment and Implementation of Primary/Secondary Schools Science/Mathematics Curricula

Unit 1 Suggested Methods of Treating Primary School Science/Mathematics Curricula
Unit 2 Suggested Methods of Treating Secondary School Science/Mathematics Curricula
Unit 3 Treatment of Selected Topics and Activities in Primary School Science/Mathematics Curricula
Unit 4 Treatment of Selected Topics and Activities in Secondary School Science/Mathematics Curricula
Unit 5 Implementation of Primary/Secondary Schools Science/Mathematics Curricula

Each unit consists of introduction, statement of learning outcomes, contents, conclusion, summary, references/further readings, and possible answers to self-assessment exercises. There are activities written at every point which are meant to assist you in achieving the stated learning outcomes of the individual units and of the course.

PRESENTATION SCHEDULE

Your course materials will give you important dates for the early and timely completion and submission of your TMAs and for attending

tutorials. You are to remember that you will need to submit all your assignments by the stipulated time and date. You should avoid lagging behind in your work.

ASSIGNMENT FILE

There are 13 assignments in this course. That is, one assignment per unit. These are designed to ensure that you have actually understood each of the units. In this file, you will find all the details of the works you must submit to your tutor, for marking.

Remember your assignments are as important as the examinations as they carry weightings of 30% for undergraduate.

ASSESSMENT

Two major methods will be used to assess the course. The first major method is through assignments while written examination will be the second. The course material has been prepared to assist you to do these assignments. You are also expected to use information and knowledge from the recommended text at the end of each unit. The assignment will carry 30% of the total marks for the undergraduate students. Final examinations of about two-hour duration will be written at the end of the course and this will also carry 70% of the total marks for the undergraduate students.

TUTOR-MARKED ASSIGNMENTS (TMAS)

The TMA is a continuous assessment component of your course. It accounts for 30% of the total score. You are required to submit at least four TMAs before you are allowed to sit for the end of course examination. The TMAs would be given to you by your facilitator and you are to return them to same as and when due.

Assignment questions for the units in this course are contained in the assignment file. You will be able to complete your assignment from the information and materials contained in your study units and references. However, it is desirable to demonstrate that you have read and researched more into other references, which will give you a wider view point and may provide a deeper understanding of the subject.

Make sure that each tutor-marked assignment reaches your facilitator on or before the deadline given in the presentation schedule and assignment file. If for any reason you cannot complete your work on time, contact your facilitator before the assignment is due to discuss the possibility of an extension. Extension will not be granted after the due date.

FINAL EXAMINATION AND GRADING

The final examination for **SED 315** will be for two hours and will carry 70% of the total marks for undergraduate students. The examination will consist of questions which reflect the type of self-testing, practice activities and tutor-marked assignments/problems you have encountered previously. All areas of the course will be assessed.

You may wish to form a discussion group of considerable number of your colleagues and practice or discuss the activities and assignments written in each unit before the examination period.

COURSE MARKING SCHEME

Assessment	**Category of Students**	**Scoring**	**Marks**
Assignment 1-13	3 for Undergraduate	each counts for 10 marks	30 marks
Final Examination	Undergraduate		70 marks
TOTAL			**100% of Course Marks**

HOW TO GET THE MOST FROM THIS COURSE

In distance learning, the study units replace the university lecture. This is one of the advantages of distance learning. You can read and work through specially designed study materials at your own pace, and at a time and place that suit you best. Think of it as if you are reading the lecture instead of listening to the lecturer. In the same way that a lecturer might give you some reading to do, the study units tell you when and what to read. You are provided with exercises, to do at appropriate points, just as a lecturer might give his/her student an in-class activity.

Each of the study units follows a common format. The first item is an introduction to the subject matter of the unit, and how a particular unit is integrated with the other units and the course as a whole. Next to this is a set of learning outcomes. These learning outcomes allow you to understand what you should be able to do by the time you have completed the unit. The learning outcomes are meant to guide your study. The moment a unit is finished, you must go back and check whether you have achieved the objectives. If this is made a habit, then you will significantly improve your chances of passing the course.

The main body of the unit guides you through the required reading from other sources. This will usually be either from your references or from a reading section.

Self-activities are interspersed throughout the units. Working through these activities will help you to achieve the objectives of the unit and prepare you for the assignments and the examination. You should do each self-activity as you come to it in the study unit.

The following is a practical strategy for working through the course. If you run into any trouble, telephone your tutor or visit the study centre nearest to you. Remember that your tutor's job is to help you. When you need assistance, do not hesitate to call and ask your tutor to provide it.

(1) Organize a Study Schedule: Design a 'Course Overview' to guide you through the Course. Note the time you are expected to spend on each unit and how the assignments relate to the units. Important information, e.g. details of your tutorials, and the date of the first day of the Semester are available at the study centre. You need to gather all the information into one place, such as your diary or a wall calendar. Whatever method you choose to use, you should decide on and write in your own dates and schedule of work for each unit.

(2) Once you have created your own study schedule, do everything to stay faithful to it. The major reason that students fail is that they get behind with their course work. If you get into difficulties with your schedule please, let your tutor know before it is too late for help.

(3) Turn to Unit 1, and read the introduction and the learning outcomes for the unit.

(4) Assemble the study materials: Information about what you need for a unit is given in the 'Overview' at the beginning of each unit. You will always need both the study unit you are working on and one of your text books on your desk at the same time.

(5) Keep an eye on the course information that will be continuously posted to you. Visit your study centre whenever you need up to date information.

(6) Well before the relevant due dates (about 4 weeks before due dates), visit your study centre for your next required assignment. Keep in mind that you will learn a lot by doing the assignment carefully. They have been designed to help you achieve the

learning outcomes of the course and, therefore, will help you pass the examination. Submit all assignments not later than the due date.

(7) Review the objectives for each study unit to confirm that you have achieved them. If you feel unsure about any of the objectives, review the study materials or consult your tutor. When you are confident that you have achieved a unit's objectives, you can start on the next unit. Proceed unit by unit through the course and try to space your study so that you can keep yourself on schedule.

(8) When you have submitted an assignment to your tutor for marking, do not wait for its return before starting on the next unit. Keep to your schedule. When the Assignment is returned, pay particular attention to your tutor's comments, both on the tutor-marked assignment form and also the written comments on the assignments, consult your tutor as soon as possible if you have any questions or problems.

(9) After completing the last unit, review the course and prepare yourself for the final examination. Check that you have achieved the unit objectives (listed at the beginning of each unit) and the course objectives (listed in the Course Guide).

TUTOR AND TUTORIALS

Tutorials shall be provided in support of this course. You will be notified of the dates, times and location of these tutorials as well as the names and phone number of your facilitator, as soon as you are allocated a tutorial group.

Your tutor or facilitator will mark and comment on your assignments, keep a close watch on your progress on any difficulties you might encounter and provide assistance to you during the course. Submit your tutor-marked assignment to your tutor before the due date; at least two working days are required. They will be marked by your tutor and returned to you as soon as possible.

Do not hesitate to contact your facilitator on telephone, e–mail and discuss problems if you need assistance. The following might be circumstances in which you would find help necessary. Contact your facilitator if:

1. You do not understand any part of the study units or the assigned readings.
2. You have difficulty with the self-test or activities.

3. You have a question or problem with an assignment, with your tutor's comment or with the grading of an assignment.

You should try your best to attend the tutorials. This is the only chance to have a face-to-face contact with your course facilitator and to ask questions which are answered instantly. You can raise any problem encountered in the course of your study. To gain much benefit from course tutorials prepare a question list before attending them. You will learn a lot from participating in active discussion.

SUMMARY

SED 315 intends to introduce you to The Nigerian primary/secondary school science/mathematics curricula. Upon completing the course, you will be equipped with basic knowledge and skills that will place you in the status of Science teachers.

Among others, you will be able to attempt these kinds of questions:

i. What are the objectives of primary school science/mathematics curriculum?
ii. What are the objectives of secondary school science/mathematics curriculum?
iii. What are the necessary requirements for organising primary school science/mathematics curriculum?
iv. How will you assess the organisational pattern of secondary school science/mathematics curriculum?
v. What are the methods of treating primary school science/mathematics curriculum?
vi. What are the methods of treating secondary school science/mathematics curriculum?
vii. How will you justify the implementation of primary school science/mathematics curriculum?
viii. How will you justify the implementation of secondary school science/mathematics curriculum?

MAIN COURSE

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Module 1 The Objectives of Primary and Secondary Schools Science and Mathematics Curricula

Introduction

In this module, you will be exposed to the concept of objective. In recent time as it has been the case over the years, basic science and technology came as a result of restructuring and integration of four primary and junior school science curricula.

The concern of this module therefore is to give an overview of the objectives of primary education and those of secondary education as well as the specific objectives for learning science and mathematics at the primary and secondary school levels. In view of this, this module study material is divided into four (4) units as follows:

Unit 1 Educational Objectives
Unit 2 The objectives of primary school Science/Mathematics curricula
Unit 3 The objectives of junior secondary school Science/Mathematics curricula
Unit 4 The objectives of senior secondary school Science/Mathematics curricula

Unit 1 Educational Objectives

Unit Structure

1.1 Introduction

In this unit, you will be introduced to the meaning of objective; you will also get to appreciate how educational objectives are derived, identify the attributes of educational objectives as well as sort out learning objectives in science and mathematics for Nigerian schools.

1.2 Learning Outcomes

By the end of this unit, you will be able to:

- define objective
- outline the sources of educational objectives
- state the attributes of educational objectives
- identify learning objectives in science and mathematics curricula.

1.3 Educational Objectives

1.3.1 Meaning of Objective

Objective as stated in the Oxford Advance Learner's Dictionary (1995) is a thing aimed at or wished for. It is viewed in other words as a purpose. It is something which an individual's trials or efforts or actions intend to attain. (https://www.collinsdictionary.com). It is the target of any enterprise. In science/mathematics, it can be regarded as things that can be observed and proved. Learning objectives form the back bone of curriculum development in science and mathematics. They often times help in measuring learning in quantifiable terms. Objectives as a matter of fact must be specific and well structured. The general educational objectives have from time immemorial been proposed by Bloom in his taxonomy.

SELF-ASSESSMENT EXERCISE 1

Why do you think it is necessary to set objective(s) in doing something?

1.3.2 Sources of Educational Objectives

Any human endeavour as it were, requires a set of objectives to be achieved. Academic programmes equally demand that a target is set before the encounter. Such a target is known as educational objective. Educational objectives are usually derived from a collection of the cultural diversity of a given society. In addition to society, individual and nature of knowledge are also sources of educational objectives, (https://www.yourarticlelibrary.com). These objectives are products of such variables as: ideas, ideals, skills, attitudes, methods of thinking etc. In the academic arena therefore, the school attempts to achieve a set ends which tend favourably towards those recognised as suitable for the cultural system of the school environment.

SELF-ASSESSMENT EXERCISE 2

How can behavioural objectives be defined distinctively?

There are different postulated definitions of objectives which are likely presented in selected advanced books. A distinctive definition of behavioural objective however that may be considered in this regard is the one reproduced by Robert (2007) from Mager (1962),(https://www.academia.edu.). As stated, behavioural objectives are viewed as goal statements which specify those conditions for which a programme (like academic) will occur and measure for success. These objectives form the bases of what is taught and how success is reviewed in science and mathematics teaching-learning exercises.

1.3.3 Attributes of Educational Objectives

The primary aim of the school is to satisfy the society's ideals entrenched in the objectives. In order to accomplish this responsibility, a set of sound objectives must therefore be presented to the school to work on. This set of objectives is usually reflected in bits in the learning objectives.

Since educational objectives are meant to reflect or address the culture of a given society, it is expected to be of considerable quality. As such, educational objectives could be taken to be sound only when they:

1. are conceived in terms of the requirements of the social situations
2. lead toward the realization of basic human needs
3. are capable of being reduced to behaviouristic terms
4. are reliable with the democratic ideals of the society
5. are steady in their relationships with one another.

1.3.4 Learning Objectives

The entire curriculum designed for Nigerian schools contains performance objectives that guide the teachers to focus on relevant and uniform contents that could be assimilated as learning experiences by the learners. The learning experiences are products of learning objectives otherwise stated in behavioural forms. Among others, learning objectives are formulated around knowledge, comprehension, application, analysis, synthesis and evaluation (https://www.edutechwiki.unige.ch)

SELF-ASSESSMENT EXERCISE 4

Distinguish the learning objectives as they relate to knowledge, comprehension and application in science/mathematics.

Knowledge is all about the facts, information and skills which an individual acquires through experience, (https://www.en.m.wikipedia.org/wiki/). The learning objectives that relate to knowledge as outlined in Bloom's Taxonomy of Educational objectives include: to define; to recall; to identify, to distinguish; to

acquire as well as to be familiar with a variety of information. For example: at the end of a lesson, learners should be able to define a cell.

Comprehension is the power of understanding. Those learning objectives that tend towards comprehension are: to give in one's word, to illustrate, to read, to change, prepare as well as to interpret a set of information. For example, after engaging the learners through a learning experience, they should be able to illustrate refraction in a glass block.

Application entails all the actions or instances of putting a theory or discovery to practical use. Learning objectives at application level are spelled out as: to apply, to organise, to use, to classify, and to generalise a number of information. For example, at the end of a lesson, learners should be able to classify all the elements on the periodic table into groups.

SELF-ASSESSMENT EXERCISE 5

What do you think should be the tasks of science/mathematics teachers in achieving learning objectives?

The science/mathematics teachers have enormous function to perform in ensuring the accomplishment of learning objectives as it affects the three lower levels (knowledge, comprehension and application) in Bloom's Taxonomy of educational objectives. You are expected as a science/mathematics teacher to present and elicit:

(a) facts in such a way that allow learners to demonstrate knowledge
(b) definitions, relationships and principles in a manner that enable the learners to demonstrate comprehension
(c) laws, principles and conclusions in forms which make learners apply that which they have learned.

1.4 Conclusion

This unit has exposed you to the meaning of objective. You also learnt how educational objectives are derived as well as the quality of educational objectives. The unit also made clear the learning objectives obtainable in primary science/mathematics curriculum.

1.5 Summary

In this unit, you have learnt that there are distinct definitions of objective. The definition contained in Oxford Advanced Learner's Dictionary was given as a thing aimed at or wished for. You also learned that educational objectives are derived from the culture of the society to which the school

belongs. It was equally possible for you to identify the likely learning objectives in science/mathematics curriculum.

1.6 References/Further Readings

Robert, F. M. (2007). *The Practice and Profession of Teaching*. (5th ed.). Allyn and BACON Ney York, https://books.google.com.

FME (2008). *National Policy on Education*. Yaba, Lagos: NEDRC.

Oxford Advanced Learner's Dictionary (1995). *Current English Edition*

FME (2012). *9-Year Basic Education Curriculum. Basic Science and Technology Primary 1-3.* Yaba, Lagos: NERDC.

Vashist, R. P. (2008). *Encyclopedia of Curriculum Development Elementary School Curriculum vol. 3.*

1.7 Possible Answers To Self-Assessment Exercises

Self-Assessment Exercise 1
Why do you think it is necessary to set objective(s) in doing something?

Answer to SAE 1:
Setting objectives in any endeavour:

- helps to guide your focus
- helps to measure success in quantifiable terms
- helps to improve your success in the endeavour
- It forms the basis for the evaluation of the endeavour.

Self-Assessment Exercise 2
How can behavioural objectives be defined distinctively?

Answer to SAE 2: Behavioural objectives can be defined distinctively by defining them as "what the students should be able to do at the end of a learning period that they could not do beforehand". This is according to Mager (1962) as cited by Robert (2007).

Self-Assessment Exercise 3
Identify the qualities of educational objectives.

Answer to SAE 3: The qualities of educational objectives include;
1. Relevant
2. Measurable
3. Attainable
4. Logical

5. Specific
6. Observable

Self-Assessment Exercise 4
Distinguish the learning objectives as they relate to knowledge, comprehension and application in science/mathematics.

Answer to SAE 4:
Knowledge involves remembering or recall of facts and basic concepts. The learning objectives relating to knowledge include: define, list, state, etc.

Comprehension involves understanding and ability to explain ideas or concepts/The learning objectives relating to comprehension include: explain, translate, discuss, describe, etc.
Application involves the use of information in new situations. The learning objectives relating to application include: use, implement, apply, execute, etc.

Self-Assessment Exercise 5
What do you think should be the tasks of science/mathematics teachers in achieving learning objectives?

Answer to SAE 5:
As a science/mathematics teacher, your tasks are to present and elicit:
i. facts in such a way that allow learners to demonstrate knowledge,
ii. definitions, relationships and principles in a manner that enable the learners to demonstrate comprehension
iii. laws, principles and conclusions in forms which make learners apply that which they have learned.

Unit 2 The Objectives Of Primary School Science/Mathematics Curricula

Unit Structure

2.1 Introduction

You will learn from this unit the objectives of primary education and specifically those of primary school science/mathematics curricula in consonance with laying a sound foundation in scientific/mathematical knowledge for the Nigerian child.

2.2 Learning Outcomes

By the end of this unit, you will be able to:

- outline the objectives of primary education
- state the objectives of primary school science curriculum
- state the specific objectives of primary school mathematics curriculum.

2.3 Objectives of Primary School Science/Mathematics Curricula

2.3.1 The Overall Objectives of Primary Education

The Federal Ministry of Education (FME, 2008) in the National Policy on Education maintains that primary education is one given in institutions for which children of age range 6 to 11 plus are enrolled. It indicates a nine-year basic education for pupils in segments of 6 years of primary education and 3 years of junior secondary education.

Curriculum planners would have to acquire some satisfactory means for deciding and selecting which objectives would need to be achieved by an educational programme. As a result, curriculum workers would have to

work with criteria that are understood and used the same way by everyone involved in structuring of the curriculum.

SELF-ASSESSMENT EXERCISE 1

What do you expect to be the overall objectives of primary education?

The objectives of primary education are all embracing. They reveal an all-round upbringing that makes a child good citizen of Nigeria. The objectives as outlined in the National Policy on Education (F.M.E, 2012) among others include:

(a) inculcation of permanent literacy, numeracy and the ability to communicate effectively;
(b) laying a sound basis for scientific, critical and reflective thinking;
(c) instilling morals and values in the child;
(d) providing opportunities for Nigerian child to develop life manipulative skills that will enable the child function effectively in the society within the limits of the child's capacity;
(e) Give citizenship education as a basis for effective participation in and contribution to the life of the society;
(f) Develop in the child the ability to adapt to his changing environment;
(g) Provide the child with basic tools for further educational advancement, including preparation for trades and crafts of the locality.

2.3.2 Objectives of Primary School Science Curriculum

In an effort to actualise the overall objectives above, the primary education is supposed to be free, universal, compulsory and qualitative; as a result, the primary education curriculum was developed. These overall objectives provided the basis for formulating those for science as applied to other subjects also.

SELF ASSESSMENT EXERCISE 2

In specific terms, propose the likely objectives for primary school basic science and technology curriculum.

A number of reasons were given for integrating science curricula before the main objectives were stated. It was emphasised that there was the need to promote the holistic view of science at basic education level, and infuse emerging issues among others. The specific objectives that emanated from the reasons are contained in the 9-year basic education curriculum. The objectives require those pupils in primary 1-3 and those in primary 4-6 to:

i. develop interest in science and technology
ii. acquire basic knowledge and skills in science and technology
iii. apply scientific and technological knowledge and skills to meet contemporary societal needs
iv. take advantage of the numerous career opportunities provided by science and technology
v. become prepared for further studies in science and technology
vi. avoid drug abuse and related vices and
vii. be safety and security conscious.

2.3.3 Objectives of Primary School Mathematics Curriculum

In order to actualise the overall objectives of primary education as stated in unit 1, the primary mathematics curriculum was developed. Thus the primary school mathematics curriculum has its objectives tailored in line with those overall objectives. For simplicity there are separate curricula for two levels of primary (1-3 and primary 4-6) education.

SELF-ASSESSMENT EXERCISE 3

In specific terms, propose the likely objectives for primary 1-3 or primary 4 - 6 mathematics curriculum.

The objectives of learning mathematics are documented in the 9-year basic education mathematics curriculum for primary 1-3 and 4-6 respectively. These objectives which are the same for the levels of primary education require the pupils to:

i. acquire mathematical literacy that will make the child become effective in an information age
ii. cultivate the understanding and application of mathematics skills and concepts needed for prospering in the ever dynamic technology
iii. build up knowledge of the vital aspects of problem solving, communication, reasoning and connection within the study of mathematics
iv. vibrant in harnessing the numerous career opportunities provided by mathematics
v. be ready to upgrade knowledge in mathematics and other related fields

2.4 Conclusion

You have been exposed to the basic objectives of primary education and the specific objectives of primary school science and mathematics curricula as separated into two levels of primary 1-3 and 4-6 respectively.

2.5 Summary

This unit has revealed that to actualise the overall objectives of primary education, the primary school science and mathematics curricula were developed. You also learnt that basic science and technology came as a result of restructuring and integration of primary and junior school science curricula.

2.6 References/Further Readings

FME (2008). *National Policy on Education*. Yaba, Lagos: NEDRC Press.

FME (2012). 9-*Year Basic Education Curriculum. Mathematics, Primary 1-3.* Yaba, Lagos: NEDRC Press.

Robert, F. M. (2007). *The Practice and Profession Of Teaching*. (5th ed.). New York: Allyn and BACON https://books.google.com>about

Vashist, R. P. (2008). *Encyclopaedia of Curriculum Development Elementary School Curriculum vol. 3.*

2.7 Possible Answers To Self Assessment Exercises (SAEs)

Self-Assessment Exercise 1
What do you expect to be the overall objectives of primary education?

Answer to SAE 1
The overall objectives of primary education include:

i. To inculcate permanent literacy, numeracy, and ability to communicate effectively;
ii. Lay a sound basis for scientific and reflective thinking;
iii. Give the child opportunities for developing manipulative skills that will enable him to function effectively in the society within the limits of his capacity;
iv. Give citizenship education for the child to participate effectively in and contribute to the life of the society.

Self-Assessment Exercise 2
In specific terms, propose the likely objectives for primary school Basic science and technology curriculum.

Answer to SAE 2
Specifically, the objectives for primary school Basic science and technology curriculum are to prepare pupils to:

1. Develop interest in science and technology;

2. Acquire basic knowledge and skills in science and technology;
3. Apply scientific and technological knowledge and skills to meet contemporary social needs;
4. Take advantage of the numerous career opportunities provided by science and technology;
5. Become prepared for further studies in science and technology.

Self-Assessment Exercise 3

In specific terms, propose the likely objectives for primary 1-3 or primary 4-6 mathematics curriculum.

Answer to SAE 3

In specific terms, the objectives of primary 1-3 or primary 4-6 mathematics curriculum include to:

1. Acquire understanding of numbers and numeration;
2. Develop ability to perform the four basic operations;
3. Develop skills in measurement, approximation and estimation;
4. Develop special concepts and ability to use them;
5. Acquire the techniques of collecting, representing and interpreting data;
6. Develop positive attitudes towards mathematics and make good use of leisure time;
7. Develop techniques of investigation and problem solving strategies.

Unit 3 The Objectives of Junior Secondary School Science/Mathematics Curricula

Unit Structure

3.1 Introduction

This unit will enable you to reflect on compositions of the overall objectives of junior secondary education. It will as well acquaint you with the specific objectives of junior secondary school science and mathematics curricula. These objectives in actual sense convey the relevance of science and mathematics to manpower development in Nigeria.

3.2 Learning Outcomes

By the end of this unit, you will be able to:

- outline the objectives of junior secondary education
- state the specific objectives of junior secondary school science curriculum
- outline the objectives of junior secondary school mathematics curriculum

3.3 Objectives of Junior Secondary School Science/Mathematics Curricula

3.3.1 The Overall Objectives of Junior Secondary Education

Just as the National Policy on Education outlines the objectives of primary education, it similarly provided those for secondary education. It stated in

clear terms that junior secondary education is one which Nigerian child is enrolled and receives just after completing primary education. It is of three-year basic education duration.

SELF ASSESSMENT EXERCISE 1

What do you think should constitute the overall objectives of junior secondary education?

The objectives of secondary education are all relevant for further development of the child. They also provide the means to further strengthen the making of a child an ambitious citizen of Nigeria. The objectives as outlined in NPE among others include:

(a) providing the Nigerian child with varied basic knowledge and skills for free enterprise and for furthering his/her education
(b) developing loyal youths who will be ready to contribute to social development and demonstrate some civic responsibility
(c) instilling values and raising morally upright persons that can think progressively all alone and who treasure dignity of labour
(d) inspiring national awareness and harmonious co-existence among citizens despite differences in endowment, religion, ethnic and socio-economic background.

3.3.2 Objectives of junior secondary school science curriculum

In order to actualise the overall objectives above, the secondary education is effected through a given curriculum which contains some fields of studies, science subjects inclusive. Parts of the overall objectives provided the basis for formulating those for the study of science.

SELF ASSESSMENT EXERCISE 2

In specific terms, propose the likely objectives for junior secondary school science curriculum.

The objectives of the junior secondary school science curriculum are meant to help students:

i. develop interest in science and technology
ii. acquire basic knowledge and skills in science and technology
iii. apply their scientific and technological knowledge and skills to meet societal needs
iv. take advantage of the numerous career opportunities offered by science and technology
v. become prepared for further studies in science and technology.

3.3.3 Objectives of Junior Secondary School Mathematics Curriculum

The objectives of the junior secondary school mathematics curriculum provide the Nigerian child the opportunity for further progress in mathematical skills acquisition. The objectives enable students to:

i. gain mathematical literacy needed to function in an information age
ii. develop the thoughtful and relevant mathematics skills and concepts required to succeed in the present dynamic technological world
iii. expand the important aspect of problem solving, communication, reasoning and connection within the study of mathematics
iv. realise the major ideas of mathematics with the awareness of the fact that the world has ever been changing.

SELF ASSESSMENT EXERCISE 3

In specific terms, propose the likely objectives for junior secondary school mathematics curriculum.

3.4 Conclusion

This unit has exposed you to the compositions of the overall objectives of junior secondary education. It has as well provided you with the specific objectives of junior secondary school science and mathematics curricula.

3.5 Summary

This unit enabled you to obtain required information on compositions of the overall objectives of junior secondary school education as contained in curriculum. Specific objectives of junior secondary school science and mathematics curricula stated revealed the relevance of the subjects to manpower development in Nigeria.

3.6 References/Further Readings

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3.7 Possible Answers To Self-Assessment Exercises

Self-Assessment Exercise 1
What do you think should constitute the overall objectives of junior secondary education?

Answer to SAE 1
The overall objectives of junior secondary education should be to:
1. inculcate national consciousness and national unity in the child
2. inculcate the right type of values and attitudes for the survival of individual and the Nigerian society
3. train the mind in the understanding of the world around
4. enable a child to acquire appropriate skills, abilities and competencies, both mental and physical, as equipment to live and contribute to the development of the society.

Self-Assessment Exercise 2
In specific terms, propose the likely objectives for junior secondary school science curriculum.

Answer to SAE 2
The objectives of junior secondary school science curriculum should be to:
1. develop curiosity and interest in science
2. acquire basic scientific knowledge and concepts for living in and contributing to a scientific and technological world
3. develop the ability to inquire and solve problems
4. become familiar with the language of science and be equipped with the skills to communicate ideas in science-related contexts
5. be prepared for further studies or careers in scientific and technological fields.

Self-Assessment Exercise 3
In specific terms, propose the likely objectives for junior secondary school mathematics curriculum.

Answer to SAE 3
In specific terms, the objectives of junior secondary school mathematics curriculum are to:

1. help students to develop the ability to use mathematics to formulate and solve problems in everyday life, as well as in mathematical contexts.
2. enable students to manipulate numbers, symbols and other mathematical objects.
3. help students to gain mathematical literacy needed to function in an information age.
4. enable students to develop mathematical conceptualization, inquiry, reasoning and communication skills.
5. prepare children to become capable of further learning in mathematics and mathematics-related areas.
6. help students to appreciate the aesthetic nature and cultural aspects of mathematics.

Unit 4 The Objectives Of Senior Secondary School Science And Mathematics Curricula

Unit Structure

4.1 Introduction

In this unit, you will further learn the components of the objectives of senior secondary education. You will also be informed about the specific objectives of senior secondary school science and mathematics curricula to reveal their significance to equipping young learners for further empowerment.

4.2 Learning Outcomes

By the end of this unit, you will be able to:

- outline the objectives of senior secondary education
- state the specific objectives of senior secondary school science (biology, chemistry and physics) curriculum.
- give the objectives of secondary school agricultural science curriculum
- mention the main objectives of senior secondary school mathematics curriculum.

4.3 Objectives of Senior Secondary School Science/Mathematics Curricula

4.3.1 Objectives of senior secondary school education

The Federal Ministry of Education (2008) in the National Policy on Education outlined the objectives of post-basic education for Nigerian

children. The post-basic education includes any of: senior secondary education; higher school and continuing education. In the NPE, it is indicated that senior secondary school education is an education received by children beyond the post-basic level having satisfied the requirements for completing the 9-year basic education. It is of three-year education duration.

SELF-ASSESSMENT EXERCISE 1

State the overall objectives of senior secondary education.

The senior secondary education is one received after a child has successfully completed the nine-year basic education. Few among the objectives of senior secondary education outlined in NPE are presented below:

(a) offering diversified curriculum that caters for divergence in talents, opportunities and future roles of the citizens
(b) providing educated manpower in such areas as applied science, technology and commerce at sub-professional ranks
(c) providing specific skills in entrepreneurial, technical and vocational jobs for self-reliance, as well as for agricultural, industrial, commercial and economic development
(d) inspiring adolescents with an aspiration for self-improvement and attainment of quality.

4.3.2 Objectives of Senior Secondary School Science Curriculum

The overall objectives of secondary education serve as basis for composing the senior secondary school science curriculum. This curriculum contains a body of scientific knowledge to be acquired by students in order to function beyond the basic education level. You will appreciate why the Federal Ministry of Education proposed such objectives as necessary ingredients for advancement of science and the social lives of the learners.

SELF-ASSESSMENT EXERCISE 2

In specific terms, propose the likely objectives for senior secondary school Biology curriculum.

Senior secondary school science curriculum is subject specific, i.e., each field of science (biology, chemistry and physics) has its peculiar curriculum that spells out the objectives.

The specific objectives of senior secondary biology curriculum as derived from NPE (F.M.E., 2008), are meant to prepare learners to acquire:

i. adequate laboratory and field skills in biology
ii. meaningful and relevant knowledge in biology
iii. ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture
iv. reasonable and functional scientific attitude.

SELF ASSESSMENT EXERCISE 3

What are the objectives for senior secondary school Chemistry Curriculum?

The objectives of Chemistry education were borne from the revised edition of the senior secondary school chemistry curriculum. The curriculum is expected to meet the following objectives:

i. help students develop interest in the subject of chemistry
ii. enable students acquire basic theoretical and practical knowledge and skills
iii. allow learners to develop interest in science, technology and mathematics
iv. help learners acquire basic STM knowledge and skills
v. ensure the development of reasonable level of competence in ICT applications that will engender entrepreneurial skills in students
vi. provide learners the means to apply skills to meet societal needs of creating employment and wealth
vii. create a position for learners to take advantage of the numerous career opportunities offered by chemistry
viii. encourage the learners to adequately get prepared for further studies in chemistry

SELF-ASSESSMENT EXERCISE 4

What are the objectives for senior secondary school Physics Curriculum?

Our world is changing every day and a number of issues or challenges needed to be addressed. The physics curriculum was proposed in order that it is relevant, appropriate and current in a rapidly changing world under the influence of ICT. The objectives of physics curriculum therefore posit to:

i. provide basic literacy in physics for functional living in the society
ii. acquire basic concepts and principles of physics as a preparation for further studies
iii. acquire essential scientific skills and attitudes as a preparation for technological application of physics
iv. stimulate and enhance creativity.

SELF-ASSESSMENT EXERCISE 5

What are the objectives for senior secondary school Agricultural Science Curriculum?

A number of issues ranging from local to international that affect the functional knowledge and skills for productive life informed the basis for the objectives of Agricultural science. These objectives ensure the:

i. stimulation and sustenance of students' interest in Agriculture
ii. impartation of functional knowledge and practical skills in Agriculture to students
iii. preparation of students for further studies in Agriculture
iv. preparation of students for occupation in Agriculture

SELF ASSESSMENT EXERCISE 6

In specific terms, propose the likely objectives for senior secondary school mathematics curriculum.

The senior secondary mathematics curriculum takes into consideration the relevance of the subject to global world. The objectives of its curriculum enable students to:

i. prepare for further and tertiary education
ii. develop skills that enhance capital market skills
iii. be proficient in the application of ICT
iv. acquire competency in various vocations they may wish to pursue at tertiary level.

4.4 Conclusion

In this unit, you have learnt the objectives of senior secondary education as well as those specific for senior secondary school science and mathematics curricula. These objectives reveal the relevance of these subjects to the advancement of the learners in coping with the ever dynamic world.

4.5 Summary

This unit has acquainted you with objectives of science and mathematics curriculum. The unit also outlined the specific objectives of Biology, chemistry, physics, agricultural science and mathematics curriculum that make the learning of these subjects a worthwhile endeavour.

4.6 References/Further Readings

FME (2008). *National Policy on Education*. Yaba, Lagos: NERDC Press.

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4.7 Possible Answers to Self-Assessment Exercises

Self-Assessment Exercise 1
State the overall objectives of senior secondary school education.

Answer to SAE 1
Objectives of secondary school education are among others, to:

i. acquire necessary knowledge, skills and attitudes for the development of the self and the nation;
ii. build a firm foundation for further education and training;
iii. develop ability for enquiry, critical thinking and rational judgement;
iv. develop into a responsible and socially well-adjusted person;
v. build a foundation for technological and industrial development;
vi. develop into a self-disciplined individual who appreciates work and manages time properly.

Self-Assessment Exercise 2
In specific terms, propose the likely objectives for senior secondary school biology curriculum.

Answer to SAE 2
In specific terms, the objectives for senior secondary school Biology curriculum are among others, to:

i. prepare students to acquire adequate laboratory and field skills in Biology;
ii. acquire meaningful and relevant knowledge in Biology;
iii. acquire the ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture;

iv. acquire reasonable and functional scientific attitude.

Self-Assessment Exercise 3
What are the objectives for senior secondary school chemistry curriculum?

Answers to SAE 3
The objectives for senior secondary school chemistry curriculum include among others, to;

i. help students develop interest in the study of chemistry;
ii. allow learners to develop interest in Science, Technology and Mathematics;
iii. help students acquire basic theoretical and practical knowledge and skills;
iv. help learners acquire basic science, mathematics and technology knowledge and skills;
v. ensure the development of reasonable level of competence in ICT applications that will engender entrepreneurial skills in students;
vi. provide learners the means to apply skills to meet societal needs of creating employment and wealth;
vii. create a position for learners to take advantage of the numerous career opportunities offered by chemistry;
viii. encourage the learners the adequately get prepared for further studies in chemistry

Self-Assessment Exercise 4
What are the objectives for senior secondary school Physics curriculum?

Answers to SAE 4
The objectives for senior secondary school Physics curriculum include among others, to:

i. acquire basic knowledge of the organizational concepts and techniques in practical physics and laboratory management;
ii. planning and effectively executing physics-based lessons in secondary schools;
iii. enabling learners have sound basic knowledge of the physics concepts and principles to equip them for further studies in physics and physics-related courses
iv. provide basic literacy in physics for functional living in the society

Self-Assessment Exercise 5
What are the objectives for senior secondary school Agricultural science curriculum?

Answers to SAE 5
Specifically, the objectives of senior secondary school Agricultural science curriculum include among others, to;

i. stimulate and sustain students' interest in Agriculture;
ii. impart functional knowledge and practical skills in Agriculture to students;
iii. prepare students for further studies in area of Agriculture;
iv. prepare students for occupation in Agriculture,

Self-Assessment Exercise 6
In specific terms, propose the likely objectives for senior secondary school mathematics curriculum.

Answer to SAE 6
Specifically, the objectives of the senior secondary school mathematics curriculum include among others, to:

i. appropriately and responsibly use technology to enhance opportunities for students' mathematical thinking;
ii. improve understanding of the nature of mathematics –what is important, how it is practical, how mathematical validity is determined
iii. increase understanding of secondary school students' mathematical thinking and understanding;
iv. develop the knowledge, skills and attitudes necessary to pursue further studies in Mathematics;
v. develop a critical appreciation of the use of information and communication technology in Mathematics; develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others
vi. become confident in using mathematics to analyze and solve problems both in school and in real lie situations.

Module 2 Organisation of Primary/Secondary Schools Science/Mathematics Curricula

Introduction

In this module, you will become skilled in the styles adopted in the organization of both science and mathematics curricula. The ever dynamic global challenges have been the basis for the Federal Government to effect reforms in education, thus mandating Nigeria Educational Research and Development Council (NERDC) to develop curricula for use at the nation's levels of education system. Recently, several attempts were made to improve the existing primary and secondary school curricula to meet the purposes for which the government is embarking on such venture. The recent reform took into consideration in organising the curriculum the national economic empowerment and development strategies (NEEDS) and the millennium development goals (MDGs). Series of such efforts resulted in the development and organisation of the present curriculum at both lower and senior levels of primary and secondary education in the country.

The aim of this module 2 therefore is to examine the meaning of organisation and the structuring of science and mathematics curricula at both primary and secondary school levels. In view of this, the module is divided into four units as follows:

Unit 1 Organisation of Curriculum
Unit 2 Organisation of Primary School Science/Mathematics Curriculum
Unit 3 Organisation of Junior Secondary School Science/Mathematics Curriculum
Unit 4 Organisation of Senior Secondary School Science/Mathematics Curriculum

Unit 1 Organisation of Curriculum

Unit Structure

1.1 Introduction
1.2 Learning Outcomes
1.3 Organisation of Curriculum
  1.3.1 The Meaning of Curriculum Organisation
  1.3.2 Learning Units
  1.3.3 Curriculum Programmes
  1.3.4 Pattern of Learning Sequence
  1.3.5 Methods of Curriculum Organisation
1.4 Conclusion

1.1 Introduction

In this module, you will learn the meaning of curriculum organization. You will also become skilled in identifying units of learning, curriculum programmes, develop patterns of learning sequence as well as classify methods of curriculum organisation.

1.2 Learning Outcomes

By the end of this unit, you will be able to:

- define curriculum organisation
- identify units of learning
- classify methods of curriculum organisation.

1.3 Organisation of Curriculum

1.3.1 Meaning of Curriculum Organisation

Curriculum has been defined in different ways. Dada (1999) refers to it as planned learning experiences usually provided by a school for learners to attain some designated learning outcomes as their ability could tolerate. A curriculum is a set of courses and content offered within the walls of a school or university. It is important that a teacher understands the manner in which the contents of a subject are arranged so as to have a rewarding class practice. It is a set of prevailing issues as well as learners' experiences that planners related together to prepare a structure which serve as document on which learning is directed.

Curriculum organization refers to the curriculum contents that are structured to reveal the relationships existing among the elements. Thus, curriculum organisation is a process of intentionally changing content into learners' experiences as well as making learning experiences sequential, integral and successive. For a curriculum to be organised, it is important that the curriculum ideology is determined, curriculum goal is set and the curriculum content is selected. The process involves selecting curriculum elements from the subject, the existing social life and the learners' experiences, then designing the selected curriculum elements appropriately in order to form the curriculum structure and type, (https://www.academia.edu). The organisation of curriculum plays an important role in determining the order in which the material is taught and how it is presented, (https://www.injoe.org)

SELF-ASSESSMENT EXERCISE 1

How will you define curriculum organisation?

1.3.2 Learning Units

The curriculum at any level is made up of sub-divisions. The smallest sub-divisions of the curriculum constitute the unit of learning. Thus, the curriculum is composed of sequence of units over a period of years in addition to any extra activities.

To identify the guides, a decision is required as it affects some fundamental issues involved with respect to whether the basis for the curriculum is found on organised area of human experiences. The curriculum of old has been described by Fafunwa (1974) as one based on the 4Rs (reading, writing, arithmetic and religion) and meant essentially to teach Christianity. The present volume composed due to reforms however deviates from this tradition. Some categories of experiences are accepted as basis for curriculum development. Similarly, the basic concept of the aim of education that emphasises the continuous improvement in the quality of individual development and group living is considered paramount. In other words, a democratic life for the principle of organisation is adopted.

SELF ASSESSMENT EXERCISE 2

Identify the basic guide for organizing curriculum.

1.3.3 Curriculum Programmes

Curriculum programmes usually stem up from patterns of learning experiences which may be categorised into four as follows:

(i) levels of mental development is considered for successive age levels and distinguished into: doing and telling, using the tools of knowledge and making generalisations.
(ii) nearness in time and space which implies beginning with the home and progress gradually through the community to the entire world.
(iii) complexity of social processes that specifies apparently the use of instructional experiences as a guide to arrange some learning experiences into grade themes in the order of the priority, e.g. geographical discoveries come before scientific invention.
(iv) progress toward a social ideal is used in programmes which move toward the development of a social ideal that leads to the attainment of goal that is dependent upon growth in social understanding.

Curriculum programmes may be classified differently due to the prevailing development.

There are three (3) categories of curriculum development namely:
(i) themes,
(ii) culture periods and
(iii) social functions.

You must have known that science and mathematics curricula are organised around themes. Here themes are used as basis for complete reorganisation of the curricula. This style ensures that rather than organising the curriculum by subjects, it is instead divided into a number of controlling themes. As such depending on the class, several units are selected that contribute to the understanding of the themes. This permits the possibility to give to learning a new unity. This of course is more or less a new direction that enables the learners render a greater contribution to the society with greater personal satisfaction.

SELF ASSESSMENT EXERCISE 3

Critically examine the fundamental programmes of the science/mathematics curricula development.

1.3.4 Learning Sequence

There is a unique framework that determines how learning is sequenced. A curriculum framework is a broad structure of concepts and guidelines that informs the school the education policy of the country. As a plan, it interprets educational aims with regards to the individuals and society to understand all kinds of learning experiences that teacher should provide to children.

Learning sequence as it affects curriculum reorganisation is usually conceived on two axes. The first is built on one axis showing the areas of living and the second on another axis showing the progressive levels of child's development. It is these levels of child's maturation that furnish the sequence of learning activities from one year to another.

SELF ASSESSMENT EXERCISE 4

What is basis for sequencing learning activities in the curriculum?

1.3.5 Methods of Curriculum Organisation

It is usually relatively simpler to determine the level for each subject or its parts if a curriculum is conceived as a series of subject with each

having a well-defined content. The task of the developer is just to determine empirically the level in which the segment of the subject is well learned.

It will interest you to discover that three methods of organizing the curriculum include:

(i) Subject organization in which learning experiences occur within the limits of organised field of knowledge.
(ii) Activity organisation which requires that experiences are agreeably planned by the students and the teachers.
(iii) Core organisation which is characterised by scheduling to provide larger blocks of time than the usual periods.

SELF ASSESSMENT EXERCISE 5

Suggest the methods of organizing the curriculum.

1.4 Conclusion

In this unit you have learned the meaning of curriculum organisation as well as the learning units, categories of curriculum development and methods of organizing curriculum.

1.5 Summary

This unit provided you with the meaning of curriculum organisation as a process of intentionally changing content into learners' experiences as well as making learning experiences sequential, integral and successive. You have learned that learning units constitute the curriculum and that out of the three classes of curriculum development, science/mathematics curricula are thematic in nature. The unit also explained the methods of organising curriculum with respect to subject, activity and core.

1.6 References/Further Readings

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1.7 Possible Answers to Self-Assessment Exercises (SAEs)

Self-Assessment Exercise 1
How will you define curriculum organisation?

Answer to SAE 1
Organization refers to the arrangement of parts to form a whole. Curriculum organization therefore, is the process of intentionally changing the curriculum content into students' learning experiences and making learning experiences sequential, integral and successive after curriculum ideology has been determined, curriculum goal has been set, and curriculum content has been selected.

Self-Assessment Exercise 2
Identify the basic guide for organizing curriculum.

Answer to SAE 2
The basic guide for organising curriculum is to identify:
a. The problem/need (What)
b. The characteristics and needs of learners (Target audience – Who)
c. The changes intended for learners (Intended outcomes – What the learner will be able to do)
d. The important and relevant content (What)
e. The methods to accomplish intended outcomes (How)
f. The evaluation strategies for methods, content, and intended outcomes (What works)

According to Bonus and Hasegawa (2014), the guide for curriculum organisation involves:
a. Formulating the curricular aims, goals, and objectives
b. Selecting the appropriate curriculum content
c. Selecting the appropriate learning experiences
d. Selecting the evaluation procedures.

Self-Assessment Exercise 3
Critically examine the fundamental programmes of the science/mathematics curricula development.

Answer to SAE 3
The fundamental programmes of the science/mathematics curricula development are classified into:

- Themes
- Culture periods
- Social functions

A theme is a central topic, subject, or message within a narrative. It is a message or abstract idea that emerges from a literary work's treatment of its subject matter. In Mathematics, the following are examples of themes, among others; Number and Numeration, Algebraic processes, etc.

A cultural period is a time marked by a particular way of understanding the world through culture and technology. Changes in cultural period are marked by fundamental changes in the way people perceive and understand the world.

Social function means a sponsored pre-arranged gathering of people, who come together based on a common interest. It is an event in an enclosed area, but it does not include a conference, meeting on public issue forum or debate to which the general public is invited or permitted.

Self-Assessment Exercise 4
What is the basis for sequencing learning activities in the curriculum?

Answer to SAE 4
The basis for sequencing learning activities in the curriculum can be classified into the following:

- Concrete – Abstract Sequencing: This is a type of sequencing method requiring organisation of the content from concrete and physical to abstract and symbolic. For instance, teaching geometric concrete objects before rules or theorems about geometric objects.
- Deductive Sequencing: This is a type of sequencing method requiring organization of the content from general to specific. For instance, teach concept of database before teaching specific types of database.
- Easy–to-Difficult Sequencing: It is a type of sequencing method requiring organization of the content from easy to difficult content. For instance, teach how to spell short words in language class before long word.
- Hierarchical Sequencing: It is a type of sequencing method requiring teaching simpler components skills of the content, before moving to more complex skills. For instance, learners need to know how to add, before they can understand the concept of multiplication in mathematics class.

- Procedural Sequencing: It requires teaching the first steps of a procedure in the sequence then helping the learners to complete remaining steps. For instance, in teaching how to apply t-test in a specific research question, it includes step-by-step procedure such as stating hypothesis, deciding which type of t-test would be used, checking the assumptions, and running t-test in statistics software.
- Scaffolding: It includes a variety of the sequencing methods that reduces the support little by little, and increases the standard of performance gradually. For instance, suppose you teach how to swim to a child, using scaffolding method, show the child how to stay on the water, and when he tries it, support him. Then, decrease the support gradually. Finally, the child can swim by himself.

Self-Assessment Exercise 5
Suggest the methods of organising the curriculum.

Answer to SAE 5
The methods of organising the curriculum include:

- Subject Organisation. In this case, learning experiences occur within the limits of organised field of knowledge.
- Activity Organisation. In this case, learning experiences are planned by both the students and the teachers.
- Core Organisation. In this case, larger blocks of time than the usual periods are scheduled.

Unit 2 Organisation of Primary School Science/Mathematics Curricula

Unit Structure

2.1 Introduction

In this unit, you will learn how the curriculum is organized in primary school. You will also become skilled in identifying the necessary requirement in organizing primary education mathematics curriculum. You will discover that the mathematics curriculum is also organized into themes. You will need to study the elements of the curriculum adequately.

2.2 Learning Outcomes

By the end of this unit, you will be able to:

- describe how primary curriculum is organized before now
- explain the requirements for organising primary education curriculum
- structure the contents of primary science education into themes.
- identify the conditions for organising primary mathematics education curriculum
- propose the organisational style adopted for primary mathematics education curriculum.

2.3 Organisation of Primary School Science/Mathematics Curricula

2.3.1 Curriculum Organisation in Primary School

A vast majority of primary schools organise curriculum with respect to subjects and works. As such a topic is taken to be the mode for organising curriculum as well as frequently inquiry based. This brings variety of subjects together as a single theme. The teacher is expected to be skillful in how the contents of the subject he/she teaches are arranged so as to have a worthwhile class practice.

The primary education curriculum was organised as separate works and subjects such that Mathematics, English, primary science, music, physical education, etc., were taught separately. Such style of primary education has been so hostile to pupils in the idea that children should be exposed to in those subjects. Such subject divisions have posed challenges as they become inconsistent with the child's world view. However, learners ought to be given the freedom to construct their own meaning; the subject teaching is more or less an imposition of a received version of knowledge.

SELF ASSESSMENT EXERCISE 1

Give a reflective analysis of how primary education curriculum was formerly organized.

2.3.2 Requirements for Organising Primary Education Curriculum

The decision of the Federal Government to introduce Universal Basic Education (UBE) programme informed the Nigerian Educational Research and Development Council (NERDC) to restructure and realign all the then existing primary and junior secondary curricula into the present 9-year basic education curriculum for implementation in Nigerian schools.

You will agree that the process of organising a curriculum cannot be done by an individual alone. Having obtained the existing curricula, a government agency like NERDC would first and foremost embark on consultations with stakeholders like: curriculum experts, subject matter specialists, you as a teacher, policy makers, employers of labour, as well as the parents. The consultations would involve various levels such as concept formulation and high level policy committee that will prepare a conceptual framework for the curriculum intended to be restructured.

It is the framework that will register and group the related disciplines such as pre-vocational studies, religious and value education. It is the key

concepts in the existing curricula that provide enabling environment for organising the contents of any new subject into a unified whole.

SELF ASSESSMENT EXERCISE 2

What do you think should be considered for organising primary education curriculum?

2.3.3 Organisation of Primary Education Science Curriculum

Most efforts at reviewing the primary education science curriculum are geared towards reducing the overload within and across subjects. This should be done with a view to sustain the depth of coverage, appropriateness and the interrelationship of the curricula contents. The present curriculum thus laid premium on the issues of value reorientation, poverty eradication, family life/HIV and AIDS education, critical thinking, entrepreneurship and life skills in addition to the encouragement of innovative teaching and learning strategies.

The organisation of the curriculum cannot be complete without the provision of the contents, performance objectives, teacher's and learners' activities, instructional materials and evaluation guide.

SELF ASSESSMENT EXERCISE 3

Describe how basic science and technology curriculum is organized/structured.

The basic science and technology curriculum came from the restructuring and integration of four primary and junior secondary school science curricula which include: basic science, basic technology, physical and health education and information communication technology (ICT).

This elementary level of Nigeria science education curriculum has its content organised thematically i.e. in themes. This is sentimentally meant to present scientific and technological concepts as well as necessary skills to the learners in a holistic manner. The science curriculum at this level of Nigerian education system is organised into four **themes** namely:

1. basic science,
2. basic technology,
3. physical and health education and
4. information technology (IT).

Each of these themes is further categorised into sub-themes in relation to the learner's stages of development (Piaget's theory) and levels of

education (i.e., primary or junior secondary). The topics in each theme are spirally sequenced from simple to complex through the schooling period.

2.3.4 Conditions for Organising Primary Mathematics Education Curriculum

The same conditions for organising primary education curriculum are applied in organising primary mathematics education curriculum. The curriculum is one that enables teachers to organise classroom experiences with respect to the learners' nature and environment in addition to providing opportunities to all children. To make teaching a means of harnessing the child's creative nature, a fundamental change in organising the curriculum cannot but be effected.

SELF ASSESSMENT EXERCISE 4

What do you think should be considered for organizing primary mathematics education curriculum?

The existing curricula before a reform is considered by a government agency like NERDC who embarks on consultations with stakeholders at various levels of concept formulation and high level policy committee for the preparation of a conceptual framework for the new curriculum intended. The framework helps in identifying and grouping related disciplines. The key concepts in such existing curricula provided the necessary elements for organising the contents of the new subject into a unified whole.

2.3.5 Organisation of Primary Education Mathematics Curriculum

You must always remember that the curriculum is the total experiences which all learners must acquire. Such experiences are made possible through the contents, performance objectives, teachers and learners' activities, instructional materials and evaluation guide.

SELF-ASSESSMENT EXERCISE 5

Make clarifications on the style of organising primary education mathematics curriculum with that for science curriculum.

As stated earlier on the organisation of primary education science curriculum, the mathematics curriculum is also organised following a thematic approach by selecting the content as well as the learning experiences in the curriculum. The thematic approach makes bold the accommodation of emerging issues while sustaining the structure of the

curriculum. The curriculum equally has sub-themes. The primary education mathematics curriculum however is made of five themes viz:

1. number and numeration,
2. basic operations,
3. algebraic processes,
4. mensuration and geometry as well as
5. every day statistics.

2.4 Conclusion

This unit has revealed how primary school curriculum is organised as well as the conditions for organizing the curriculum. You have also learnt that the same style adopted in organising science curriculum i.e. thematic approach is applicable for primary mathematics education curriculum.

2.5 Summary

This unit considered the manner in which primary school curricula were separately organised on subject basis. It also provided the conditions to be satisfied in organising primary science and mathematics curricula as well as the style adopted. The unit informed you that the primary science curriculum is organised into four **themes** namely: basic science, basic technology, physical and health education and information technology (IT) while mathematics education curriculum is organised into five themes: (1). number and numeration, (2) basic operations, (3) algebraic processes, (4) mensuration and geometry, (5) every day statistics, with sub-themes in order of complexity.

2.6 References/Further Readings

Alexander, R. J. (1991). *Primary Education in Leeds*. University of Leeds. Alexander, R. J. (1992). *Policy and practice in Primary Education*. Routledge.

FME (2008). *National Policy on Education*. Yaba, Lagos: NEDRC Press.

FME (2012). *Primary Education Mathematics Curriculum, Primary 1-3; 4-6.* Yaba, Lagos: NEDRC Press.

2.7 Possible Answers To Self-Assessment Exercises

Self-Assessment Exercise 1
Give a reflective analysis of how primary education curriculum was formerly organized.
Answer to SAE 1
Formerly, the primary education curriculum was organised on the basis of separate subjects, such as Mathematics, English, Primary science, etc. Hence, these subjects were taught separately.

Self-Assessment Exercise 2
What do you think should be considered for organizing primary education curriculum?
Answer to SAE 2
In organising primary education curriculum, the following should be considered:

- What to teach – Contents
- Objectives
- How to teach – the educational approach or method
- Teacher's and learners' activities
- Instructional materials
- Evaluation guide

Self-Assessment Exercise 3
Describe how Basic science and technology curriculum is organised/structured.
Answer to SAE 3
The basic science and technology curriculum adopts a thematic approach of curriculum organisation. It is organised around four themes namely:

- Basic science
- Basic technology
- Physical and health education (PHE)
- Information technology (IT)

Each theme is further categorised into sub-themes as follows:

Theme	Sub-theme
Basic Science Basic technology	• Learning about our environment • You and energy • Science and development • Understanding basic technology • Materials and processing • Drawing practice • Tools, machines and processes • Safety • Basic human movement

Physical and health education	• Sports and games • Health education • Moving out body parts • Athletics • Contact and non-contact games
Information technology	• Basic computer operations and concepts • Computer ethics • Computer application packages • Basic knowledge of information technology

Self-Assessment Exercise 4

What do you think should be considered for organising primary education mathematic curriculum?

Answer to SAE 4

In organising the primary education mathematics curriculum, it is important to consider the following, among others:

- The contents to be taught
- The aims and objectives
- Appropriate instructional materials
- Methods of assessment.

Self-Assessment Exercise 5

Make clarifications on the style of organising primary education mathematics curriculum with that for science curriculum.

Answer to SAE 5

The primary education mathematics curriculum is also organized following a thematic approach just as the primary education science curriculum. The curriculum is made up of five (5) themes, which are

1. Number and Numeration
2. Basic Operations
3. Algebraic processes
4. Mensuration and Geometry
5. Everyday Statistics

Just as in the case of primary education science curriculum, the primary education mathematics curriculum equally has sub-themes.

Unit 3 Organisation of Junior Secondary School Science/Mathematics Curricula

Unit Structure

3.1 Introduction

In this unit, you will learn the process of organising secondary education curriculum. You will also be taken through the organizational procedure of both junior secondary science and mathematics education curricula. You will realise that science and mathematics education are built along a continuum.

3.2 Learning Outcomes

By the end of this unit, you will be able to:

- describe the pattern of organising junior secondary curriculum.
- identify the various themes involved in organising junior secondary education curriculum
- structure the contents of junior secondary mathematics education into themes.

3.3 Organisation of Junior Secondary School Science/Mathematics Curricula

3.3.1 Organising Junior Secondary Education Curriculum

The basic issues shaping the development of nations globally and influence the world of knowledge serve as a guide in selecting the contents for junior secondary curriculum. Such issues as globalisation, information communication technology and entrepreneurship education

are paramount. This development necessitated shifts in topics from one class to another. Also, a number of relevant contents are infused.

SELF-ASSESSMENT EXERCISE 1

What should curriculum developers consider when organising a curriculum?

There are many ways to select ideas, translate them into instructional patterns and package them into curriculum programmes. Those possibilities are forever increasing as our knowledge of the world becomes more sophisticated. Curriculum planners/developers would need to pay specific attention to areas of relevance. They are not to make any organisational decisions by personal decree but manage a give-and-take political process in which the views of teachers, board members, parents and other area heads are considered (Babarinde, 2002).

3.3.2 Organization of Junior Secondary Education Science Curriculum

The junior secondary education is by government policy the higher segment of the UBE which is a 9-year basic education. At the junior secondary level, the basic science curriculum is developed with special consideration given to non-school innovations around environmental education, drug abuse, population and family life and sexually transmitted infections (including HIV).

SELF ASSESSMENT EXERCISE 2

How is basic science curriculum organised?

The basic science curriculum has its contents organised in such a way as to achieve a holistic presentation of science and technology to learners; as such a thematic approach to content organisation permeated. Four themes selected covered knowledge, skills and attitudinal requirements. The four themes are: you and environment, living and non-living things, you and technology and you and energy. The themes have the topics under them spirally sequenced. This style allows the arrangement of content beginning with the simple to the complex across the duration of the basic education.

3.3.3 Organization of Junior Secondary Education Mathematics Curriculum

The curriculum at the junior level for mathematics is organised in line with the tenet of the basic education programme in which case two levels

of education are infused into basic 1- 9. Due to local and global changes experienced in every nation including Nigeria, the curriculum is made more responsive to the survival and developmental needs of Nigerian child.

SELF ASSESSMENT EXERCISE 3

Describe how junior secondary mathematics curriculum is organised/structured.

This curriculum placed emphasis on affective domain as well as quantitative reasoning. The content and learning experiences are selected and organised thematically just as applied in basic science. The junior secondary mathematics curriculum has its themes as:

1. Number and numeration,
2. Basic operations,
3. Algebraic processes,
4. Geometry and mensuration and
5. Everyday statistics.

3.4 Conclusion

In this unit you have learned the process of organising secondary education curriculum. You also learned that the organisational procedure of both junior secondary science and mathematics education curricula is similar. You have discovered that science and mathematics education are built along a continuum.

3.5 Summary

This unit has revealed the process of organising secondary education curriculum. It also indicated the organisational procedure of both junior secondary science and mathematics education curricula. You have also discovered that the science and mathematics curricula are thematic in nature and while science curriculum has four themes, the mathematics curriculum is made of five themes.

3.6 References/Further Readings

Babarinde, K. (2002). "Philosophy of the Curriculum." In J. A. Ajala, (Ed). Designing Content of the Curriculum. A Guide to Practice. Ibadan: MayBest Publications.

FME (2008). *National Policy on Education*. Yaba, Lagos: NEDRC Press.

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3.7 Possible Answers To Self-Assessment Exercises (SAES)

Self-Assessment Exercise 1
What should curriculum developers consider when organising a curriculum?

Answer to SAE 1
In organising a curriculum, curriculum developers should consider the following:

1. What will be taught i.e. the issue/problem/need should be identified
2. Who will be taught i.e. the target audience and their characteristics and need will be identified
3. What the learners will be able to do i.e. the intended outcomes/objectives which are the changes intended for learners
4. The important and relevant content
5. How the content will be taught i.e. the methods to accomplish intended outcomes
6. Evaluation strategies for methods, content, and intended outcomes

Self-Assessment Exercise 2
How is basic science curriculum organised?

Answer to SAE 2
The Basic science curriculum is organised using a thematic approach. The curriculum has four (4) themes, namely:

1. You and environment
2. Living and non-living things
3. You and technology
4. You and energy

The topics under the themes are spirally sequenced.

Self-Assessment Exercise 3
Describe how junior secondary mathematics curriculum is organized/ structured

Answer to SAE 3
The junior secondary mathematics curriculum is organized thematically also. The cyrriculum has the following themes:

1. Number and Numeration
2. Basic Operations
3. Algebraic Processes
4. Geometry and Mensuration
5. Everyday Statistics.

Unit 4 Organisation of Secondary School Science And Mathematics Curricula

Unit Structure

4.1 Introduction

In the last unit, you have learned how junior secondary education science and mathematics curricula are organized. You will as well learn how senior secondary education science and mathematics curricula are organized in this present unit.

4.2 Learning Outcomes

After studying this unit, you should be able to:

- identify the various themes involved in organising senior secondary science education curricula
- outline the similarity in the organisation of science curricula
- structure the contents of senior secondary mathematics education into themes.

4.3 Organisation of Secondary School Science/Mathematics Curricula

4.3.1 Organisation of Senior Secondary Science Education Curriculum

The need for curriculum reform is to tackle diversity of problems that affect students, teachers and the society at large (Adesoji, 2002). Science ought to be recognised as an integral part of the environment of the Nigerian child. This is necessary because the attitude of the learners is influenced by how they view the life around them. It is imperative

therefore that the science curricula contain contents that encourage the child to select from among alternatives those things that will enable him/her cope with learning experiences. The science disciplines are separated into single subject at the senior secondary level in Nigeria, as such separate curriculum is produced for each.

SELF-ASSESSMENT EXERCISE 1

How is Biology curriculum organised?

The Biology curriculum organisers take into consideration field studies, guided discovery, laboratory techniques and skills in addition to conceptual thinking in their effort at structuring the content of the subject. The curriculum is meant to provide a modern biology course which will satisfy the need of the learners and the society (FME, 2009). The content of the curriculum covers four themes which include:

1. organisation of life,
2. organisms at work,
3. the organism and its environment and
4. continuity of life.

In addition to the thematic arrangement, the courses are sequenced spirally. This permits the arrangement of concepts to run throughout the three-year beyond the junior secondary level. However, in-depth coverage of the concepts is expected as the learners move from lower class to higher others. Aside, the curriculum is organised into six sections namely:

(i) topic,
(ii). performance objectives,
(iii). content,
(iv). activities,
(v). teaching and learning materials and
(vi). evaluation guide.

An example excerpted from Biology curriculum is presented below:

Topic	Performance objectives	Content	Activities		Teaching and learning materials	Evaluation
			Teacher	Students		
Fruits	Students should be able to: distinguish between fruit and a seed	Structure of fruit	Brings various kinds of fruits to the class	Bringvarious kinds of fruits to the class as teacher requested	Fruits	Students to state the main distinguishing features of fruits and seed

SELF-ASSESSMENT EXERCISE 2

What dimension of curriculum organization is adopted for chemistry education?

The organisers of chemistry curriculum put into consideration the major issues that shape the development of nations globally, which as well influence world of knowledge. As such the selection of contents of chemistry curriculum is centered also around four themes such as:

1. the chemical world
2. chemistry and environment
3. chemistry and industry and
4. chemistry and life.

These themes are also spirally arranged through the three years of senior secondary chemistry learning and contain topics that reveal the level of coverage of the content.

SELF ASSESSMENT EXERCISE 3

What dimension of curriculum organization is adopted for Physics education?

The organisers of Physics curriculum made effort to deviate from the conceptual approach of the old curriculum but structured the content of the curriculum adopting the thematic approach. This is necessary in order to meet up with the national and global issues. As obtained in other science disciplines the physics curriculum has six themes that possess related concepts and topics thus:

1. interaction of matter, space and time
2. conservation principles
3. waves: motion without material transfer
4. fields at rest and in motion
5. energy quantization and duality of matter and
6. physics in technology

These themes also follow spiral content organisation through the three years of senior secondary physics learning and are arranged into seven sections. Example is reproduced from SS1 Physics curriculum as shown below:

Topic	Performance objectives	Content	Activities		Teaching and learning materials	Evaluation guide
			Teacher	Student		
Time	Students should be able to construct a clock for measuring time interval for simple system that has a repetitive motion.	1. Concept of time. 2. Ways of measuring time.	Lead discussion In the use Of repetitive events to define day and night, seasons and festivals	1. Practice the use of: *heart beat *sand-clock *Pendulum *Stop clock /watch to measure time interval	Sand-clock, funnel sand, beaker, retort stand, etc.	Students to use different types of measuring instruments to measure time correctly.

4.3.2 Organisation of Senior Secondary Education Mathematics Curriculum

Mathematics educators worldwide have shown great concern about the degree of mathematical understanding revealed by students in primary and secondary schools (Akinsola, 2002). This called for reform of some sorts as the knowledge of mathematics plays enormous roles in economic and political development of a nation. The more reason that mathematics is part of universal basic education makes the subject to appear in the curriculum for all children.

SELF ASSESSMENT EXERCISE 4

Describe how senior secondary mathematics curriculum is structured.

The mathematics curriculum at the senior secondary level is organised in such a way as to accommodate few introductory topics in matrices, modular arithmetic and simple calculus. The thematic content organization of the subject is modified from a six-pronged approach to a five-pronged approach. The five themes identified are:

1. number and numeration
2. algebraic processes
3. geometry
4. statistics and
5. introductory calculus

These themes have topics spirally organised through the three-year of senior secondary education.

4.4 Conclusion

In this unit you have learned how senior secondary education science and mathematics curricula are organised. The unit also exposed you to the series of themes in science and mathematics curricula as learning document for secondary education in Nigeria.

4.5 Summary

This unit has indicated the process of organising senior secondary education curricula in those subjects as biology, chemistry, physics and mathematics. It also indicated that the contents of the curricula are all organised into themes and sequenced spirally. You have also discovered that there are four themes in both biology and chemistry while physics has six. Mathematics curriculum has five themes.

4.6 References/Further Readings

Adesoji, F. A. (2002). "Rethinking the science Curriculum." In J. A. Ajala, (Ed.) *Designing Content of the Curriculum. A Guide to Practice*. Ibadan: MayBest Publications.

Akinsola, M. K. (2002). New Directions in School Mathematics. In J. A. Ajala, (Ed.) *Designing Content of the Curriculum. A Guide to Practice*. Ibadan: MayBest Publications.

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FME (2007). *Senior Secondary Physics Education Curriculum*. Yaba-Lagos: NERDC Press.

FME (2012). *Senior Secondary Mathematics Education Curriculum*. Yaba-Lagos: NERDC Press.

4.7 Possible Answers To Self-Assessment Exercises

Self-Assessment Exercise 1
How is biology curriculum organised?
Answer to SAE 1
The biology curriculum is organised using the thematic arrangement. The curriculum has four themes namely:
1. Organisation of life
2. Organisms at work
3. The organism and its environment
4. Continuity of life

In addition to the thematic approach, the concepts are sequenced spirally. Moreover, the curriculum is organized into six (6) sections namely: Topic; Performance objectives; Content; Activities (Teacher's and students' activities); Instructional materials; Evaluation guide.

Self-Assessment Exercise 2
What dimension of curriculum organisation is adopted for chemistry education?
Answer to SAE 2
Chemistry education also adopts the thematic approach of curriculum organization. The themes are:
1. The chemical world
2. Chemistry and environment
3. Chemistry and industry
4. Chemistry and life

The themes are also spirally arranged through the three years of senior secondary chemistry education.

Self-Assessment Exercise 3
What dimension of curriculum organisation is adopted for physics education?
Answer to SAE 3
The Physics education also adopts the thematic approach of curriculum organization. The curriculum has six (6) themes which are:
1. Interaction of matter, space and time
2. Conservation principles
3. Waves: motion without material transfer
4. Fields at rest and in motion
5. Energy quantization and duality of matter
6. Physics in technology

The themes also follow spiral content organization through the three (3) years of senior secondary education. The curriculum is organized into six (6) sections just as for the chemistry curriculum. These sections are: Topic; Performance objectives; Content; Teacher's and students' activities; Instructional materials; and Evaluation guide

Self-Assessment Exercise 4

Describe how senior secondary mathematics curriculum is structured.

Answer to SAE 4

The senior secondary mathematics curriculum is also organized thematically. The themes are:

1. Number and Numeration
2. Algebraic processes
3. Geometry
4. Statistics
5. Introductory calculus

The topics are also spirally organised through the three years of senior secondary education.

Module 3 Treatment and Implementation of Primary/Secondary Schools Science/Mathematics Curricula

Introduction

In this module, you will be exposed to the concept of Integrated Science. In the late sixties and early seventies, several attempts were made to improve the teaching of General Science in schools. One of such attempts resulted to the introduction of Integrated Science at lower level of secondary education presently referred to as Junior Secondary level.

The concern of this module therefore is to examine the meaning and historical background of the development of Integrated Science teaching, trace the changes in the objectives of science education that have occurred throughout the period and examine the trends of continuity which may be revealed in Integrated Science programmes in Nigeria. In view of this, the module three of the material is divided into five units as follows:

Unit 1 Suggested Methods of Treating Primary School Science/Mathematics Curricula
Unit 2 Suggested Methods of Treating Secondary School Science/Mathematics Curricula
Unit 3 Treatment of Selected Topics and Activities in Primary School Science/Mathematics Curricula
Unit 4 Treatment of Selected Topics and Activities in Secondary School Science/Mathematics Curricula
Unit 5 Implementation of Primary/Secondary Schools Science/Mathematics Curricula

Unit 1 Suggested Methods of Treating Primary School Science/Mathematics Curricula

Unit Structure

1.1 Introduction
1.2 Learning Outcomes
1.3 Suggested Methods of Treating Primary School Science/Mathematics Curricula
  1.3.1 Meaning of Method and Treatment
  1.3.2 Some Methods of Treating Primary School Science Curriculum
  1.3.3 Some Methods of Treating Primary School Mathematics Curriculum
1.4 Conclusion
1.5 Summary

1.1 Introduction

In this unit, you will learn the meaning of method and treatment. You will as well appreciate the methods of treating primary school science and mathematics curricula as applicable to Nigeria in particular.

1.2 Learning Outcomes

By the end of this unit, you will be able to:

- define method and treatment
- give the methods for treating primary school science curriculum
- state some methods of treating primary school mathematics curriculum.

1.3 Suggested Methods of Treating Primary School Science/Mathematics Curricula

1.3.1 Meaning of Method and Treatment

The term method could be defined in several ways relative to the subject matter, however as derived from Latin word “methodus”, it means a way of teaching or going. The Greek, from another perspective coined the word “methodos” to mean scientific inquiry or method of inquiry or investigation or original pursuit or a follow after. Thus, method can be said to be a procedure or manner of doing something according to specific plan.

Treatment also can be viewed differently reflective of the discipline in which it is used. Treatment can be the manner in which someone behaves or deals with someone or something. It is the presentation or discussion of a subject. It implies that science/mathematics teachers use different methods to treat each of the subjects they teach.

SELF-ASSESSMENT EXERCISE 1

How will you define method and treatment as a science/mathematics teacher?

You will come to realise that to define method and treatment as a teacher, you will have to be concerned with their relationship with your profession – teaching. As a result, method could be a mode of procedure or orderly, logical or systematic manner of instruction, inquiry, investigation,

experiment or presentation of lesson in the classroom. It is a systematic plan followed in presenting material for instruction, (https://www.merriam-webster.com). It is the orderliness of thought as well as techniques or arrangement of the subject a teacher teaches.

Though treatment is considered from care givers point of view as things done to relieve or cure an illness or correct any problem, it is agreed from the sphere of schooling to be an act of handling the subject a teacher teaches as well as the behavior of teachers towards the pupils/students being thought or vice versa. It is a way of dealing with or discussing a subject matter in schools. The disposition of the teacher to the pupils under his/her care may to some extent determine the attitude of the learners towards science/mathematics which they learn in schools.

SELF-ASSESSMENT EXERCISE 2

What should the science/mathematics teacher consider for selecting a method or treatment?

The teaching of science and mathematics is no doubt derived from contemporary theoretical understanding of learners' cognitive development. It equally involves the engagement with the epistemological issues pertaining to each subject. As a result, the teacher would have to familiarise self with new ideas and concepts with the help of illustrations drawn from relevant topics. Every teacher must take responsibility of translating the recommendations of NERDC into pedagogic and assessment strategies.

SELF-ASSESSMENT EXERCISE 3

Why should method and treatment be considered as determinants of success in learning science/mathematics?

It is known that quality education is nothing more than involving children in joyful and meaningful learning at schools. Establishment of such education leads learners to attain necessary life skills that enable them become good and useful members of the society. The best way to provide quality education cannot be separated from the method adopted in inculcating such education and the treatment involved in dealing with every situation in the course of educating the child. It thus requires that the school system be made flexible in their activities in order to allow innovations and promotion of creativity among the learners.

SELF ASSESSMENT EXERCISE 4

What general methods are applicable for teaching science/mathematics curriculum in primary school?

The use of appropriate methods of teaching constitutes good teaching and learning of primary school science/mathematics. However, Azuka *et al* (2012). had opined that one of the most persistent and undeniable problems besetting achievement in the teaching of mathematics (and probably of science) in Nigeria is poor quality of teaching. It is noted that primary schools in Nigeria mostly do not have science laboratory, nevertheless teachers are expected to conduct practical lessons/activity-based lessons for pupils. Although, project and field trips methods are recommended, primary school teachers make use of demonstration and discovery methods of teaching oftentimes. They often use instructional materials for teaching and make provision for improvisation where real or manufactured ones are not available.

1.3.2 Some Methods of Treating Primary School Science Curriculum

As contained in the primary school basic science and technology curriculum, the guided inquiry and activity-based teaching and learning with the use of locally available materials are advocated. The aim is to enrich the pupils' awareness of the fact that science is not abstract ideology but the doings they engage in and around them.

It is important that the science teacher takes into consideration the developmental stages of the learners as well as the theme of the curriculum and the topic to be taught in selecting a method. Thus, primary school science teacher may make use of: demonstration, discussion or field trip etc.

In demonstration, the teacher carries out a procedure or performs a process in the presence of the learners. The objective of this method could be to show the learners how to do such a thing by themselves to illustrate specific principles. It is a means of stimulating learners' interest in science.

Discussion allows the teacher and the pupils to share ideas, relate cordially on matters associated to a given problem or situation as well as a question. This method informs that the pupils are not empty barrels rather, they have some background information about what they intend to learn. It is a method that helps promote inquiry as well as develop problem- solving abilities.

Field trip is a means of taking learners outside the classroom in order to make some observations, collections or classification of things in their natural domain. This method helps teachers to realize both cognitive and affective objectives.

SELF ASSESSMENT EXERCISE 5

What methods do you think are appropriate for treating primary school science curriculum?

1.3.3 Some Methods of Treating Primary School Mathematics Curriculum

The primary school mathematics curriculum places more emphasis on affective domain and quantitative reasoning. The purpose is to enable the learners develop good cognitive and psychomotor capabilities. As such, methods that boost these domains of learning are adopted for the learners to make the most of the learning experiences.
Just as other disciplines, the primary school mathematics curriculum may be treated with a number of methods which may range from demonstration, guided discovery, problem-solving, short visit, etc.

Guided discovery directs the teacher to carefully see the prospects, prompt with care, and structure the sequence of events so that the learners need not re-formulate the circle. In this method the learners detect the experience elicited when the teacher takes a lead in directing the learning situation.

Fajemidagba (2001) had proposed that in mathematics teaching and learning, some heuristics have been developed for teaching problem solving. To him, heuristics is nothing but ways and means of discovery and invention. This method comes to play when the mathematics teacher presents a problem by asking a question from the learners in order to elicit alternative approaches; this helps in emphasising the desirability of a variety of search strategies. A small group of learners could be assigned to work out a problem by first discussing and presenting their findings.

SELF-ASSESSMENT EXERCISE 6

Identify the appropriate methods for treating primary school mathematics curriculum.

1.4 Conclusion

This unit provided the meaning of method and treatment with specific reference to science and mathematics curricula. Similarly, some forms of methods for treating primary science/mathematics were explained.

1.5 Summary

In this unit, the meaning of method is presented as a procedure or manner of doing something according to specific plan, while treatment is taken to be the manner in which someone behaves or deals with someone or something. The unit also identified some methods for treating primary school science/mathematics curricula like: demonstration, field trip, guided discovery, problem-solving etc.

1.6 References/Further Readings

Azuka, B. F., Durojaiye, D., Okwuoza, S. O. & Jekayinfa, O. (2013). "Attitude of primary school mathematics teachers towards the use of activity-based learning mathematics in teaching mathematics in Nigeria schools." *International Journal of Education Learning and Development* 1(1) 22-36. Available online on 23/1/2015.

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FME (2012). *Senior Secondary Mathematics Education Curriculum*. Yaba-Lagos: NERDC.

1.7 Possible Answers To Self-Assessment Exercise

Self-assessment Exercise 1
How will you define method and treatment as a science/mathematics teacher?

Answer to SAE 1
Method is the process by which a task is completed. It is a way of doing something according to specific plan. In terms of teaching of science/mathematics, method can therefore be defined as the procedure or orderly, logical or systematic manner of instruction, inquiry, investigation, experiment or presentation of science or mathematics lesson in the classroom.

Treatment on the other hand, is the manner in which someone behaves towards or deals with someone or something. Hence, in terms of science/mathematics education, treatment is the manner of dealing with or discussing the science or mathematics subject matter in schools. It involves the disposition of the teacher to the pupils under his/her care.

Self-Assessment Exercise 2
What should the science /mathematics teacher consider for selecting a method or treatment?

Answer to SAE 2
In selecting a method or treatment, the science/mathematics teacher should consider the following:
i. learners' cognitive developmental stages
ii. Concepts/topics to be taught
iii. Recommendations of NERDC, among others.

Self-Assessment Exercise 3
Why should method and treatment be considered as determinants of success in learning science/mathematics?

Answer to SAE 3
Method and treatment should be considered as determinants of success in learning science/mathematics because appropriate and effective method and treatment help to inculcate quality education. Also, effective method and treatment which provide flexibility in activities allow innovations and promote creativity among the learners.

Self-Assessment Exercise 4
What general methods are applicable for teaching science/mathematics curricula in primary school?

Answer to SAE 4
The general methods applicable for teaching science/mathematics curricula in primary school are: Project; field trip; demonstration; discovery methods, among others.

Self-Assessment Exercise 5
What method do you think are appropriate for treating primary school science curriculum?

Answer to SAE 5
The methods appropriate for treating primary school science curriculum are: guided inquiry and activity-based teaching and learning with the use of locally available materials; demonstration; discussion; field trip. etc.

Self-Assessment Exercise 6
Identify the appropriate methods for treating primary school mathematics curriculum.

Answer to SAE 6
The appropriate methods for treating primary school mathematics curriculum include: demonstration; guided discovery; problem-solving; short visit.

Unit 2 Suggested Methods of Treating Secondary School Science/Mathematics Curricula

Unit Structure

2.1 Introduction

In this unit, you will learn some methods of treating secondary school science and mathematics curricula. Specifically, the peculiarity of any given method to each of the disciplines will be examined and their relevance to the learning experience.

2.2 Learning Outcomes

By the end of this unit, you will be able to:

- explain the approaches in treating secondary school science/mathematics curriculum
- give the concept of methods for treating secondary school science/mathematics curricula
- identify some methods of treating secondary school science/mathematics curricula.

2.3 Suggested Methods of Treating Secondary School Science/Mathematics Curricula

2.3.1 Approaches for Treating Secondary School Science/Mathematics Curricula

The study of science and mathematics is quite essential in a world characterised by international tension, jet proportion, sensational

machines and atomic fission. It is possible to identify two approaches common to both science and mathematics at the secondary school level.

SELF ASSESSMENT EXERCISE 1

Briefly identify the two approaches common to secondary school science and mathematics curriculum.

The two common approaches in secondary school science and mathematics include: Differentiated Learning which involves the use of science and mathematics and General Education. Attempts are made in General Education Approach to:

(i) further develop the process, principles and generalizations that are introduced at the basic education level.
(ii) continue the logical integration of science and mathematics with the other areas of learning.
(iii) refine the utilization of the scientific and systematic methods of thinking.

SELF-ASSESSMENT EXERCISE 2

What influences the direction of treating science/mathematics curricula at secondary school level?

The direction of treating science/mathematics curricula is influenced by the crucial need to develop an understanding of the main generalizations, functional competence in the basic skills, and the desire and ability to think quantitatively, qualitatively and scientifically. As a result, four aspects of the secondary school programmes of science and mathematics are identified to include:

(i). **objectives** in which social emphasis is prominent in the objectives for the "general courses" while the differentiated areas are characterized by a distinct vocational or professional emphasis.
(ii). **direction of learning experience** in secondary science/mathematics involves re-teaching and provision for redial instruction when needed, a growing recognition of the importance of language adequacy, an increased effort to use real-life situations for instructional purposes and the use of many materials and teaching aids for enrichment purposes and to make teaching more effective.
(iii). **intensification of learning** in which learning experiences are considered to be constantly intensified in order to help young ones prepare to: more effectively manage the personal aspects of learning; understand and intelligently accept the responsibilities of adult citizenship in a democratic society; and utilize in daily living

current and past achievement in the areas of technology and science.

(iv). **evaluation procedures** which are meant to assist in the appraisal of the learners' ability to apply the methods of quantitative, qualitative and scientific thinking toward the solution of problems in other areas and providing students with an increasing number of opportunities to actively participate in their own evaluation.

2.3.2 Concepts of Methods in Treating Secondary School Science/Mathematics Curricula

It is usually difficult and unrealistic to consider the curricula in secondary school science and mathematics without making some comments about methods of teaching. Unless methods are improved, it may be of little avail to attempt to improve upon the conventional content of the courses in these curricula areas.

SELF-ASSESSMENT EXERCISE 3

What can you consider to be the extensive concept of methods?

Throughout the professional career of a teacher he/she is more or less a constant student of methods. Generally speaking, curriculum problems and problems of teaching are much harder to pin down. This is because good teaching is constantly experimental. It is important that method and content are both adapted to the needs of the group being taught. Method and content must completely be in agreement with practices in other parts of the school, they must be possible for the teacher who is to use them, and should be understood by the school community. To think of an extensive concept of methods is a frustrating task for each teacher has to evaluate his/her teaching problems and search for those methods which make the greatest contribution to the solution of the problems. It is however necessary for the teacher to consider the idea that classroom knowledge is derived from the children's experience. This enables them to construct knowledge in successively more complex ways which present a great challenge and opportunity for systematic change.

2.3.3 Some Methods of Treating Secondary School Science/Mathematics Curricula

Orji in Azuka *et al* (2013) observed that most teachers are known to adopt lecture method which hampers teacher-student's interaction. As a result, Activity-Based Learning (ABL) strategies are advocated. ABL is viewed to be a procedure where students actively engage in the lesson rather than just sitting, listening and absorbing the lesson. At the secondary school level, it is expected that the strategy makes the learners read, write,

discuss practical activities, analyse and evaluate the topic being learned. The model of activity-based learning recommends that all learning activities should involve some kind of learner's experiences which stress observing and doing (Kathleen in Azuka *et al*, 2013).

SELF-ASSESSMENT EXERCISE 4

What should be considered for adopting ABL by a teacher?

Some areas of concern which can make ABL plausible for teachers have been outlined by Mathew (2009) in Azuka *et al.* (2013). Such areas emphasise that learning experiences should:

(i). be arranged to create motivation and interest in the learners for them to learn mathematics (science) concepts by doing.
(ii) energise the movement of learners thinking and decision-making abilities, intellectual creativity and control in life.
(iii) be stimulating, and learners should be able to relate them to life situations and bring about desirable change in behavior thus leading to their personality development.

Other areas outlined, reveal that the teacher should:
(iv) move away from telling or lecturing method but embrace the use of ABL.
(v) make sure that the learning experiences are arranged according to the need of the learners.
(vi) make learners search and gather more information in the teaching and learning of mathematics.
(vii) make learning experiences become challenging to the students and stimulate them for more self-activities.

The use of ABL is no doubt meant to help students understand mathematics (science) concepts better since they engage in learning experiences that boost higher retention in and provide opportunities for the learners to think for themselves.

SELF-ASSESSMENT EXERCISE 5

What methods do you think are appropriate for treating secondary school science/mathematics curricula?

The NERDC organised the science/mathematics curricula for senior secondary school and stressed the use of a number of methods such as field studies, guided discovery, laboratory techniques and skills with conceptual thinking. So the science/mathematics courses are student-

oriented with emphasis on experimentation, questioning, discussion and problem solving.

Laboratory method of teaching as presented by Omosewo (2001) is an activity carried out by an individual or group purposely to make observations of processes, products or events. It offers the learners the opportunity of developing manipulative skills. It allows the learners to study their immediate flora and fauna in biology, it reinforces what is learned in theory classes in chemistry and physics; it strengthens student's experimentation ability, keen observation and self-confidence. Ogunniyi (1986) has viewed laboratory exercise to mean an instructional procedure in which cause and effect, nature or properties of object or phenomenon are determined by individual experience usually under some controlled conditions. The function of laboratory exercise in learning science/mathematics serves as a means of verifying certain factors or phenomena, developing of skills, helping students to learn how to use scientific methods in problem solving among others.

2.4 Conclusion

In this unit, you have been exposed to approaches of treating secondary school science/mathematics curricula. Some methods of treating secondary school science and mathematics curricula were also given.

2.5 Summary

In this unit, the approaches for treating secondary school science/mathematics curriculum were categorised as differentiated learning and general education. The methods of treating science/mathematics in secondary school were given to range from activity-based learning which transcend through field trip, laboratory, guided discovery, demonstration problem solving and the likes.

2.6 References/Further Readings

Azuka, B. F., Durojaiye, D., Okwuoza, S. O. & Jekayinfa, O. (2013). "Attitude of primary school mathematics teachers towards the use of Activity-Based Learning mathematics in teaching mathematics in Nigeria schools." *International Journal of Education Learning and Development* 1(1) 22-36. Available online on 23/1/2015.

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2.7 Possible Answers To Self-Assessment Exercises

Self-Assessment Exercise 1
Briefly identify the two approaches common to secondary school science and mathematics curricula.

Answer to SAE 1
The two approaches common to secondary school science and mathematics curricula are:

- Differentiated Learning; and
- General Education

Self-Assessment Exercise 2
What influences the direction of treating science/mathematics curricula at secondary school level?

Answer to SAE 2
The direction of treating science/mathematics curricula at secondary school level is influenced by the essential need to understand the main generalizations, functional competence in the basic skills, and the ability to think quantitatively, qualitatively and scientifically.

Self-Assessment Exercise 3
What can you consider to be the extensive concept of methods?

Answer to SAE 3
Extensive concept of methods can be considered as the systematic procedures, techniques or modes of inquiry employed for accomplishing or doing something, especially in accordance with a definite plan, such as in science/mathematics instruction.

Self-Assessment Exercise 4
What should be considered for adopting ABL by a teacher?

Answer to SAE 4
In adopting ABL, the teacher should consider the following among others:
1. Providing learning experiences that create motivation and interest in the learners and helping them to learn concepts by doing.
2. Providing learning experiences that are stimulating and which learners should be able to relate to life situations.
3. Moving away from telling or lecturing method.
4. Arranging learning experiences according to the needs of the learners.

Self-Assessment Exercise 5
What methods do you think are appropriate for treating secondary school science/mathematics curricula?

Answer to SAE 5
The methods appropriate for treating secondary school science/mathematics curricula are activity-based methods which include; Field trip, Guided discovery, Laboratory technique, and Problem solving.

Unit 3 Treatment of Selected Topics And Activities In Primary School Science/Mathematics Curricula

Unit Structure

3.1 Introduction

In this unit, you will be introduced to selection of topics and contents in primary science and mathematics curricula. You will as well learn how to prepare lessons in primary science and mathematics curricula. The unit will also expose you to the activities of both teacher and students in the teaching and learning of primary science/mathematics.

3.2 Learning Outcomes

By the end of this unit, you will be able to:

- select topics and contents in primary science/mathematics
- prepare a lesson in primary science/mathematics
- state the activities of teacher and students in primary science/mathematics lesson.

3.3 Treatment of Selected Topics And Activities In Primary School Science/Mathematics Curricula

3.3.1 Selection of Topics in Primary Science/Mathematics Curricula

Interactions between pupils and their environment as well as the integration of their experiences with local knowledge are both necessary

in producing meaningful learning. These efforts are important in situating learning in the context of each pupil's world and in bridging the border line between the school and its natural and social environments. The significance of the local environment and the pupil's own experiences cannot be underestimated as the best entry points into the study of different subjects. Considering these factors as crucial for learning to occur is a predictor of what experience to seek to instill into the child.

SELF ASSESSMENT EXERCISE 1

How will you select topics for lessons in primary science/mathematics curricula?

The basic requirement of any course is the availability of a curriculum. As you are aware, the curriculum pertains to the learning experiences in and outside the classroom and the enabling conditions necessary for the desired teaching and learning process. It has been clarified in Unit 2 of Module 1 of this course how curriculum is organised in science/mathematics. Science/mathematics curricula are thematically organized with sub-themes spirally followed. Under each sub-theme are topics that science/mathematics teacher can select from simple to complex learning experiences. For instance, the first theme in primary science is basic science, while its first sub-theme is learning about our environment and the topics under this include: exploring our environment; soil, air and water; and colour (identification). For primary mathematics on the other hand, the first theme is number and numeration while the sub-themes are whole number and fraction. The topics under the first sub-theme include whole numbers 1-5.

Thus, for any topic to be selected, the teacher only needs to obtain a curriculum for the subject and choose the topic for a lesson in order of their spiral arrangement.

3.3.2 Selection of Content in Primary Science/Mathematics Curriculum

For learners to make the most of the learning experiences in science and mathematics, teachers must be able to select the contents in accordance with the topics to be taught for actualising cognitive validity. By cognitive validity, it simply means that the content should reflect the age of the learners in order that they can understand the subject matter. In other words, the transaction of the contents should match the level of the pupils.

Having identified the theme, the sub-theme and the topics in the curriculum, the next task for the science/mathematics teachers is to select the contents for each of the topics. Teachers must take note of the performance objectives stated in the curriculum as reflective of the expectation of the learners after being exposed to the content. Thus, considering the first topic selected in self assessment exercise 1 above, the performance objectives in the curriculum for primary science reads: pupils should be able to: observe and identify things in and around the classroom, school and home. The content that the teacher will select is already stated as: things in and around the classroom, school and home. Similarly, the mathematics curriculum has the performance objectives as pointer to the first content under the first topic: whole numbers 1-5. The performance objectives state that pupils should be able to: sort and classify number of objects in a group or collection. The content to be covered in order to achieve this objective includes sorting and classifying objects leading to idea of 1-5.

SELF ASSESSMENT EXERCISE 2

Provided a curriculum, briefly explain how you will select the content for a given topic in primary science/mathematics.

3.3.3 Preparation of Lesson in Primary Science/Mathematics Curriculum

The position of the teacher as regard facilitation of learning experiences cannot be under rated in science/mathematics classes. It is the duty of the teacher to create various situations wherein pupils interact with the teacher in a way that allows the pupils to understand the concept. The teacher also must refine or revise those concepts that proved difficult by asking questions, posing contradictions and engaging the pupils in inquiries. This will help the pupils to develop the mental skill necessary for them to think and reason well independently and to have the courage to disagree when agitated.

SELF ASSESSMENT EXERCISE 3

Why is lesson preparation necessary in science/mathematics learning?

Any individual who wishes to embark on any productive business would first need to decide on what business, the requirements in terms of resources (human, financial and materials), if not, the whole venture may hit the rock. This scenario applies in science/mathematics learning. Lesson preparation is a work plan of the teacher. It guides the teacher on itemising the important experiences necessary for the achievement of the objectives stated. Thus, lesson preparation forces the teacher to think

through what the pupils would need to learn. It as well requires the teacher to think through how to teach the content. It equally enables the teacher to decide in advance the facilities needed to enhance knowledge. It provides specified structure for the teacher and pupils and of course serves as a foundation for assessment.

The primary school science/mathematics teachers have enormous functions to perform in ensuring the accomplishment of the learning objectives for every lesson. The teacher must be aware that every lesson must identify the following precisely:

(i). the teacher's name: Dapo Funmilola
(ii). the subject: Basic Science and Technology
(iii). the theme: Basic science
(iv). sub-theme: Learning about our environment
(v). the topic: soil
(vi). the class: Primary Three
(vii). the age range: 5-7 Years
(viii) the time/duration: 9:10 – 9:45am
(ix). identification of objectives: By the end of the lesson, the pupils should be able to:
  (a) define soil and
  (b) mention the 3 importance of soil
(x) identification of instructional materials: samples of soil types, potted plant.
(xi) description of the lesson via instructional procedure:

Step	Content development	Skills	Teacher's activities	Pupils activities
1	Introduction	Set induction Questioning Reinforcement	Teacher introduces the lesson with questions based on the previous lesson: (i) mention 2 instruments for finding time. (ii) What is the unit of time?	Pupils: (i) mention 2 instruments For finding time (iii) Give The unit of time.
2	Definition	Communication	Teacher defines soil as: (i) the uppermost layer of the earth's surface on which plants grow and writes this on the board. (ii) reads out the definition three times	Pupils (i) Listen attentively to the definition (ii) repeat Reading definition after the teacher.
3	Illustration	Identification	Teacher (i) shows the class the 3 types of soil as: sandy, clay and loamy. (ii) uses the colour to identify difference	Pupils (i) observe soil types with colour difference

4	Explanation	Communication	Teacher states the importance of soil to plant and tells pupils to read after as: (i) Medium for plant growth (ii) Supplies nutrients to plant (iii) Protects the roots of plants (iv) Fixes plants in place (v) Supplies water to plants	Pupils listen attentively and read after the teacher.
5	Evaluation	Questioning Reinforcement	Teacher asks pupils to: (i) define soil (ii) mention 3 importance of soil	Pupils respond to questions
6	Summary	Repetition	Teacher redefines soil as the uppermost layer of the earth crust on which plants grow and mentions the importance of soil to plant	Pupils pay full attention to the summary.
7	Conclusion	Closure	Teacher reinforces pupils and asks them to write the board's summary	Pupils write board's summary.

SELF ASSESSMENT EXERCISE 4

What are the prerequisites needed in science/mathematics lesson preparation?

3.3.4 Activities of Teacher and Students

The contents of primary science/mathematics curricula have been identified to be treated through activity-based learning. This implies that both the teacher and pupils have unique roles to play in making the most of the learning experiences. The emphasis however, is laid much on the learner from the constructivists' point of view. The teacher only acts as a facilitator while the pupils engage in discoveries of different kinds.

SELF-ASSESSMENT EXERCISE 5

Give the specific activities expected to be addressed by the teacher and the pupils on the topic selected in 3.3.1 above.

The primary science teacher's activities in treating 'things in and around the classroom and school', as stated in NERDC is to take the pupils on a study walk around and outside the school. This activity demands that the teacher makes use of the sense of sight adequately in order to guide

against eventualities that may emanate from unruly attitude on the part of the pupils. In addition, the teacher would need to inform the pupils of the purpose of walking round the school. The pupils' activities on the other hand are to observe and to list things in the school environment. In the same vein, the sense of sight of the pupils needs to function adequately. The interactions that may come to play may include raising different kinds of questions and offering answers or arguments for them.

3.4 Conclusion

In this unit, you have been introduced to how to select specific topics and contents in primary science and mathematics curricula. You also learned what you needed to include in lesson preparation for primary science and mathematics curricula as well as the activities of both the teacher and pupils during the lesson.

3.5 Summary

In this unit, you have learnt that you have the curriculum at your disposal for selecting the topics and the contents to be taught and learned by pupils in primary science/mathematics. Specific topics and contents were selected from both primary science and mathematics curricula with their performance objectives. The roles of both the teacher and the pupils in achieving the objectives were also extracted from NERDC for you to appreciate the efforts that are needed to actualise legitimate learning experiences.

3.6 References/Further Readings

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3.7 Possible Answers To Self-Assessment Exercise

Self-Assessment Exercise 1
How will you select topics for lessons in primary science/mathematics curricula?

Answer to SAE 1
To select topics for lessons in primary science/mathematics curricula, I need to obtain the curriculum for the subject and then choose the topic for the lesson in order of their spiral arrangement.

Self-assessment Exercise 2
Provided a curriculum, briefly explain how you will select the content for a given topic in primary science/mathematics.

Answer to SAE 2
First, identify the theme, the sub-theme and the topic in the curriculum. Then, select the content by taking note of the performance objectives stated in the curriculum which are pointer to the content and reflect the expectation of the learners after being exposed to the content.

Self-Assessment Exercise 3
Why is lesson preparation necessary in science/mathematics learning?

Answer to SAE 3
Lessons preparation is necessary in science/mathematics learning because it serves as a guide that a teacher uses to determine what the students will learn, how the lesson will be taught, the facilities and materials needed to enhance knowledge, as well as how learning will be evaluated.

Self-Assessment Exercise 4
What are the prerequisites needed in science /mathematics lesson preparation?

Answer to SAE 4
The prerequisites needed in science/mathematics lesson preparation include: the subject, the theme, the sub-theme, the topic, the class, the time/duration, instructional objectives, instructional materials, instructional procedure, and evaluation.

Self-Assessment Exercise 5
Give the specific activities expected to be addressed by the teacher and the pupils on the topic selected in 3.3.1 above.

Answer to SAE 5

The specific activities expected by the teacher on the topic ‘things in and around the classroom and school’ are:

- taking the pupils on a study walk around the classroom and school.
- Making use of the sense of sight adequately in order to guide against eventualities that may emanate from unruly attitudes on the part of the pupils.
- Informing the pupils of the purpose of walking round the school.

The specific activities expected by the pupils include:

- Observing things in the school environment.
- Listing things in the school environment
- Making effective and adequate use of the sense of sight
- Raising questions and offering answers.

Unit 4 Treatment of Selected Topics And Activities In Secondary School Science/Mathematics Curricula

Unit Structure

4.1 Introduction

In this unit, you will be introduced to selection of topics and contents in secondary science and mathematics curricula. You will as well learn how to prepare lessons in secondary science and mathematics curricula. The unit will also expose you to the activities of both teacher and students in the teaching and learning of secondary science/mathematics.

4.2 Learning Outcomes

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

- select topics and contents in secondary science/mathematics
- prepare specific lesson in secondary science/mathematics
- state the activities of teacher and students in secondary science/mathematics lessons.

4.3 Treatment Of Selected Topics And Activities In Secondary School Science/Mathematics Curricula

4.3.1 Selection of Topics in Secondary Science/Mathematics Curriculum

Science and mathematics education can only be meaningful to the secondary school students when they perceive them to be true to each learner; true to life and true to the subject being offered. For science and mathematics to be true to the students implies that the subjects that the teacher teaches should be understandable to the learners and be able to engage them in meaningful and joyful learning. In like manner, for the subject to be true to life simply connotes that the science/mathematics taught by teachers should relate favourably to the surroundings of the learners, get them ready for the world of work as well as advance in them the concerns for life and conservation of the environment. For the learners to see that science and mathematics they offer is true to the subject imply that these subjects that teachers teach should convey significant aspects of the subjects' contents at appropriate level and engage the learners in learning the process of acquiring and validating scientific knowledge.

Nigeria, like any other countries in the globe possesses a learning experience document called curriculum for both junior and senior secondary school levels. As indicated in 3.3.1 of unit 3 above, the contents of secondary school science/mathematics curricula are organized into themes. These themes are spirally arranged. Each theme contains topics that science/mathematics teachers can select to actualize some specific learning experiences intended. For the purpose of clarity, specific selections are made in each of the senior secondary science subjects and mathematics. The first theme in senior secondary 1 Biology education for instance, is organization of life while the topics under it are: recognizing living things and classification of living things (I) kingdoms: monera, protista and fungi, plantae and animalia.

In senior secondary 1 Chemistry, the first theme is chemistry and industry with chemical industries as the first topic, while the senior secondary 1 Physics has interaction of matter, space and time as theme I and fundamentals and derived quantities and units as the first topics. The senior secondary I Mathematics has number and numeration as theme I modular arithmetic as the first topic. Having been provided with this document, it has reduced the stress of what to select to inculcate the intended learning experiences.

SELF-ASSESSMENT EXERCISE 1

What will you need to select topics for lessons in secondary science/mathematics curricula?

4.3.2 Selection of Contents in Secondary Science/Mathematics Curriculum

The main purposes of the various curricula for the separate sciences and mathematics as indicated in the NERDC show that the biology curriculum is meant to provide a modern biology course which will help learners and the society actualise basic needs through relevance and functionality of contents. In the same vein, contents selection in senior secondary chemistry and physics education rests on the issues of globalisation, information/communication technology and entrepreneurship.

SELF-ASSESSMENT EXERCISE 2

Give an analysis of how teachers will select contents in secondary science/mathematics curriculum.

The secondary science/mathematics teachers would find the curriculum very relevant in selecting contents to be taught under each topic. As outlined in NERDC, the science/mathematics teachers would have to take note of the performance objectives stated in the curriculum which serve as search light to what the content is meant to address. Specifically, the performance objectives for the first topic in senior secondary 1 Biology state that students should be able to: state the characteristics of living things, give examples of levels of organisation of life and state the complexity of organisation in higher organism. In order to realise these objectives, the content to be selected cuts across characteristics of living things, differences between plants and animals, organization of life: (a) levels of organization of life to include; cell (euglena, paramecium); tissue (hydra); organ (onion bulb, heart of cow) and system (digestive, excretory, etc.) as well as (b) complexity of organisation in higher organisms: advantages and disadvantages.

In senior secondary 1 chemistry, the first topic has its performance objectives to prompting: the identification of chemical industries in the learners' locality, explanation on how chemical industries have influenced learners' lives and national economies, description of environmental problems created by chemical industries and suggesting solutions to solve those problems. Equipped with these objectives, teachers will find the corresponding contents for achieving the objectives

to involve types of chemical industries, importance to: the individual, the nation and excursion to chemical industries.

Likewise, the senior secondary 1 physics has the performance objectives for the first topic to read: distinguish between fundamental and derived quantities and units. The content available for teachers to select from include: fundamental quantities: mass, length, time and electric charge; fundamental units: Kg, m, s, etc. whereas the derived quantities to be selected include force, speed and area while their derived units being N, m/s and m^2 respectively. The senior secondary mathematics itemises the performance objectives on the first topic in SS 1 as able to convert: numbers from other bases to base 10; decimal fraction from other bases to base 10; from one base to another base, etc. The content ranges from conversion from one base to base 10; conversion of decimal fraction in one base to base 10; conversion of number from one base to another base, etc.

4.3.3 Preparation of Lesson in Secondary Science/Mathematics Curriculum

The teacher in every aspect of school activities plays some fundamental roles in creating enabling and supporting environment for the process of knowledge construction by the learners to come about. The teacher in this context acts as a facilitator who encourages learners to reflect, examine and deduce facts in the process of construction of knowledge. It is the teacher who builds the skills of engaging students in discussion in a democratic set-up of the classroom to assist them to understand the expressions and concepts not understood yet. The teacher also makes the students to be sensitive to the fact that their experiences and perceptions count very much. Likewise, the teacher provides a safe space that allows students to express themselves without fear of being ridiculed and simultaneously to put up certain forms of relationship.

SELF ASSESSMENT EXERCISE 3

What is the essence of lesson preparation in senior secondary science/mathematics learning?

The broad goals of education identified in the Constitution of the Federal Republic of Nigeria are stated in the National Policy on Education (NPE), (Federal Ministry of Education, FME, 2008). These goals seek allegiance to building a free and democratic society, a just and egalitarian society, etc. The best approach to address these goals is channeling the procedure through the school. Such procedures are collections of the contents of the curriculum. In order to actualise these goals in the citizens, the teacher is mandated to select the content of the curriculum that will match the

yearnings of the Nation's constitution. It is mostly through the classroom interactions that these desires are transmitted easily. It therefore behooves of the teacher to build structures achievable in bits for the nation to getting things right. Part of the efforts put in place and or the duty of the teacher is in lesson preparation which serves as a guide for transmitting the national goals into unique realities in the various subjects offered in schools. Lesson preparation especially for science/mathematics classes is meant to direct the teacher's thinking through the learning experiences which will look plausible to the students. In like manner, the exercise helps the teacher to think of the strategies that may work best in order to make students understand the content. It nonetheless guides the teacher to choose the necessary facilities needed to enhance students' knowledge. It contains the contributions of both the teacher and students in teaching-learning process and a means for estimation.

SELF-ASSESSMENT EXERCISE 4

What should secondary school science/mathematics teachers consider when preparing a lesson?

The secondary school science/mathematics teachers should realize that the success of the classroom interaction is determined on the one hand on how the lesson is prepared and the presentation of the lesson on the other. The pattern of lesson preparation for senior secondary science/mathematics is not all that different from that applicable to primary level of Nigeria education. Thus, lesson preparation must specify the following precisely: for example:

(i). Teacher's name: Ade Olawale
(ii). Subject: Chemistry
(iii). Theme: Chemistry and Environment
(iv). Topic: Halogens
(v). Class: SS 2
(vi). Age range: 13-16 years
(vii) Time/duration: 9:20 – 10:00am/40 minutes
(viii) Date: 05/03/2014
(ix). Entry behaviour: Students are familiar with periodic table and can locate halogens on the table.
(x) Instructional objectives: At the end of the lesson, students should be able to:
    (a) state the group to which halogens belong.
    (b) write and draw the electronic configuration of halogens
    (c) enumerate the laboratory preparation of halogens.
(xi) Instructional materials required: Chart of periodic table of elements, apparatus, and reagents.

(xii) Description of the roles of the teacher and students via presentation:

Step	Content development	Skills	Teacher's activities	Pupils activities
1	Introduction	Set induction	Teacher asks students to	Students mention 20
			mention the first 20 elements on the periodic table.	elements on The periodic table.
2	Explanation	Communication	Teacher leadsstudents to identify halogens as group 7 B elements as: F, Cl, Br, I and At	Students pay attention and write in their notes the halogens given.
3	Illustration	Identification	Teacher leadsstudents to draw the electronic configuration of halogens: for 35 $_{17}$Cl, EC using shells = 2, 8,7 or using spdf orbital = $1S^2$ $2S^2$ $2P^6$ $3S^2$ $3P^5$	Students write And draw the Electronic structure of halogens
4	Explanation	Illustration	Teacher leadsstudents to set up apparatus and demonstrates the laboratory preparation of chlorine	Students observe The experiment on The laboratory Preparation of chlorine and record what they Observe correctly.
5	Evaluation	Questioning Reinforcement	Teacher asks students to: (i) identify the group to which halogens belong (ii) draw the electronic structure of ^{80} $_{35}$Br.	Students draw The electronic structure of bromine
6	Conclusion	Repetition	Teacher goes through the lesson briefly again	Students pay full attention to the brief.
7	Summary	Closure	Teacher reinforces students responses and asks them to write the board's summary	Pupils write board's summary.

4.3.4 Activities of Teacher and Students in Secondary Science/Mathematics Curriculum

The emphasis on secondary science/mathematics curricula is to treat them through engagement of students in practical activities. By so doing, it means that both the teacher and students have specific and collective

responsibilities in making the most of the learning experiences. The teacher's function among others is to provide the instruction and materials while the students work through the procedure to bring forth the desired learning experiences. The teacher and other supporting staff are present and act as facilitator and provide assistance for the learners respectively. The students under the guidance of the staff around engage in active participation in the learning process.

The Physics teacher's and students' activities in treating a topic are included in the Physics curriculum contained in NERDC (2007). The curriculum has interaction of matter, space and time as the first theme. The topic chosen under this theme is fundamental and derived quantities and units. The content selected covers fundamental quantities: mass, length, time and electric charge. Treating this content demands that the teacher holds discussions on standard and units of measurements. The students on their own part are to engage in mentioning examples of derived quantities and units.

SELF-ASSESSMENT EXERCISE 5

Examine the SS 1 physics curriculum carefully, select a topic and state the roles of the teacher and students in treating the content of such topic.

4.4 Conclusion

In this unit, you have been introduced to how to select topics and contents in secondary science and mathematics curricula. You have also learned how to prepare lessons in secondary science and mathematics curricula. The unit also exposed you to the activities of a Physics teacher and students in the teaching and learning a selected topic.

4.5 Summary

In this unit, you have learnt that you can select topics and contents from the various science education curricula and mathematics education curriculum. You have discovered that in selecting the content, you need to take into consideration the performance objectives. A format of the components of lesson preparation in a science curriculum was given as well as the activities of the teacher and students on a topic in physics.

4.6 References/Further Readings

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4.7 Possible Answers to Self-Assessment Exercises

Self-Assessment Exercise 1

What will you need to select topics for lessons in secondary science/mathematics curricula?

Answer to SAE 1
What the teacher needs to select topics for lessons in secondary science/mathematics curricula is the learning experience document called curriculum. The curriculum of any subject contains themes and these themes are arranged spirally. Each theme contains topics that science/mathematics teachers can select to achieve some intended learning outcomes.

Self-Assessment Exercise 2

Give an analysis of how teachers will select contents in secondary science/mathematics curricula.

Answer to SAE 2
In selecting contents to be taught in secondary science/mathematics the curriculum is very relevant. The science/mathematics teachers have to take note of the performance objectives stated in the curriculum which serve as search light to what the content is meant to address.

Self-Assessment Exercise 3

What is the essence of lesson preparation in senior secondary science/mathematics learning?

Answer to SAE 3
Lesson preparation is essential in the senior secondary science/mathematics learning in the following ways:

- Lesson preparation serves as a guide for transmitting the national goals into Unique realities in the various subjects offered in schools.
- It directs the teacher's thinking through the learning experiences which will look plausible to the students.
- It helps the teacher to think of the strategies that may work best in order to make students understand the content.
- It guides the teacher to choose the necessary facilities needed to enhance students' knowledge
- It contains the activities of both the teacher and students in the teaching-learning process

- It contains the evaluation.

Self-Assessment Exercise 4

What should secondary school science/mathematics teachers consider when preparing a lesson?

Answer to SAE 4
When preparing a lesson, secondary school science/mathematics teachers should consider the following, among others:

i. Subject
ii. Theme
iii. Topic
iv. Class
v. Age range
vi. Time/duration
vii. Date
viii. Entry behaviour
ix. Instructional objectives
x. Instructional materials
xi. Instructional procedure

Self-Assessment Exercise 5
Examine the SS1 Physics curriculum carefully, select a topic, and state the roles of the teacher and students in treating the content of such topic.

Answer to SAE 5
One of the topics in the Physics curriculum is 'Fundamental and derived quantities and units. Suppose the content selected is 'Fundamental quantities of mass, length, time and electric charge; to treat this content, the teacher should hold discussions on standard and unit of measurements. The students on the other hand, should engage in mentioning examples of derived quantities and units.

Unit 5 Implementation of Primary/Secondary Schools Science/Mathematics Curricula

Unit Structure

5.1 Introduction

The experience of designing a curriculum from start to finish provides an opportunity for considering some of the effects of the adaptation of such curriculum. This unit will discuss how to explore the general effects of curriculum implementation, and consider some of the broader social and environmental issues raised by the use of the curriculum. You will foremost be introduced to the concept of implementation/evaluation. You will also learn some unique influences for implementing primary and secondary schools science/mathematics curricula in Nigeria.

5.2 Learning Outcomes

By the end of this unit, you will be able to:

- explain the meaning of curriculum implementation/evaluation
- state the elements that influence curriculum implementation
- describe how primary science/mathematics curricula are being implemented
- explain the implementation procedure for secondary science/mathematics curricula.

5.3 Implementation of Primary/Secondary Schools Science/Mathematics Curricula

5.3.1 Meaning of curriculum Implementation

Curriculum implementation is all about affecting a practice on recommended learning experiences. The term refers to the act of working out the plans and suggestions that have been made by curriculum specialists and subject experts in a classroom or school setting, (https://www.researchgate.net>350). It is a process which is carried out in order to guide the learners to acquire new experience. This implies that for curriculum to be adequately implemented, the learners' involvement cannot be relegated. This is just apt because a good measure of the effectiveness of the recommended learning experience can only be possible in the course of acquisition of knowledge by the learners. A curriculum as it were is conventionally meant to be implemented by the teacher. The teacher as an agent in the implementation process of the curriculum had been identified by Stenhouse (1979) in the Commonwealth of Learning (2000) with emphasis that implementation is an approach in which the teacher selects and combines the various aspects of learning experiences in a curriculum. For implementation to occur, the teacher would need to extract from the curriculum or syllabus the content by way of drawing the scheme of work as well as the lesson plan. In addition to this effort, the teacher's personality, the instructional materials and the learning environment would also need to interact with the learner's mind sets. In summary, Curriculum implementation is the process of translating the curriculum into syllabuses, schemes of work and lesson plans and notes to be delivered to learners by the teacher.

SELF ASSESSMENT EXERCISE 1

What will you consider as the major elements influencing curriculum implementation in Nigeria?

The commonwealth of learning (2000) identified: the teacher, learners, resource materials and facilities, interest groups, school environment, culture and ideology, instructional supervisor and assessment as elements that influence curriculum implementation generally. These elements also confer enormous influence in the implementation of curriculum in Nigeria.

SELF ASSESSMENT EXERCISE 2

How do you see the teacher and the learners as paramount factors influencing curriculum implementation?

The teacher's role in curriculum implementation is all about the selection and decision on the content to teach from the curriculum. The teacher should be able to translate the curriculum objectives into reality. This cannot be possible if the teacher does not understand the content of the curriculum. In order to make this task of translating the curriculum into working tool, and for learners to benefit maximally, it is necessary that the teacher participates fully in its preparation in the first place.

The learners on their part are responsible for the assimilation of what the teacher stands to transmit from the available curriculum. For this reason, they influence what the teachers should select for learning experiences. It is important therefore to consider the learners background and ability in curriculum implementation as determinants of the extent of what can be achieved.

SELF ASSESSMENT EXERCISE 3

How will you argue the influence of resources and interest groups on curriculum implementation?

Adequate resource materials and facilities are very crucial in curriculum implementation, as they enable the teachers and the learners to carry out their roles satisfactorily. In order to actualise the importance of these elements (textbooks, instructional materials, laboratories, libraries, classroom, etc.) in curriculum implementation, they should be made available by the government to schools.

Similarly, interest groups that influence curriculum implementation may be any of: the Parents, Parents-Teachers' Associations (PTA), Old Students Association, Religious Groups, Companies, etc. Their influences are felt in the area of providing financial resources to schools for the purchase of required materials, rehabilitation of facilities and have inputs in the introduction of subjects or contents arising from global challenges into the curriculum.

5.3.2 Implementation of Primary School Science/Mathematics Curriculum

The Nigerian primary science and mathematics curricula tend much towards objectives model of curriculum design which contains content based on specific performance objectives. This model can be depicted as shown below:

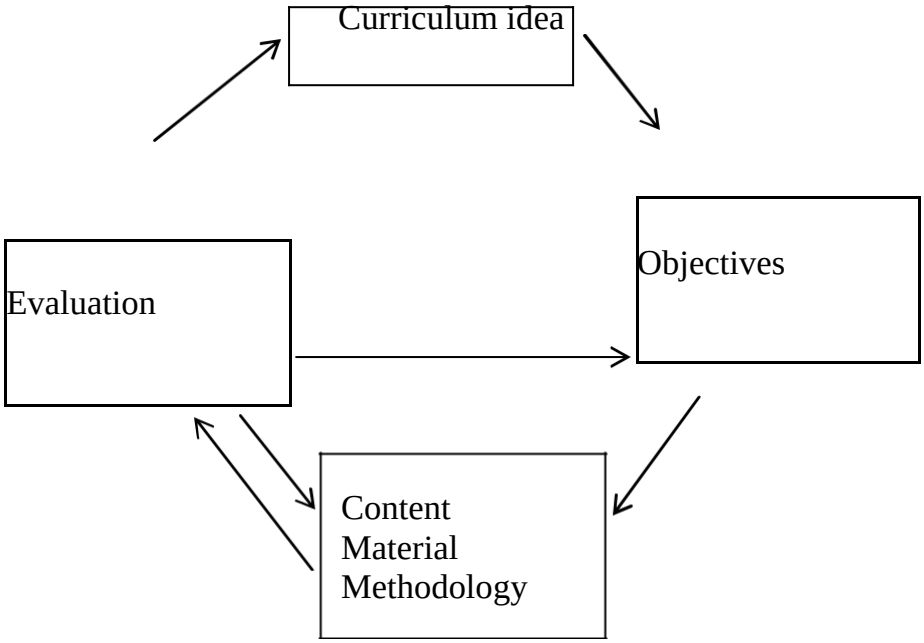

Fig. 2: Adapted from Gatawa (1990)

SELF ASSESSMENT EXERCISE 4

How does the head teacher influence primary school science/mathematics curricula implementation?

The head teacher of every primary school has a supervisory role to play in the course of implementation of both science/mathematics curricula. Most times, he/she may delegate duties to the assistants to assign staff to classes, prepare the subjects timetable, make instructional materials available, and create conducive learning environment in the school. Other functions of the head teacher in implementing the curricula are connected to checking through the teacher's schemes of work, lesson plans on daily basis as well as records of continuous assessment and other records necessary. This exercise will prompt the teacher to work assiduously to the dictate of the content of the curriculum but in a democratic set.

Curriculum implementation cannot be complete without assessment which usually takes the form of examination. As applicable in Nigeria, much emphasis is placed on certificates obtained from public examinations. This indirectly dictates the dimension through which the teacher will channel the content in the classroom. There is the tendency that the teacher may address the objectives in the curriculum or shift attention meeting the requirement of the examination bodies.

5.3.3 Implementation of Secondary School Science/Mathematics Curricula

In an effort to actualise the overall objectives in the secondary school science and mathematics curricula, it is necessary to be concerned about the methods put in place for implementation of the curricula. A number of determinants of curriculum implementation of course have been stated above which cannot be ignored. As it is known, this level of education is the focus of all stakeholders. This being because the outcome of the external examination which the learners are to attempt determines to a reasonable extent their progress or otherwise in the study of any of the variety of fields that abounds in these disciplines.

SELF-ASSESSMENT EXERCISE 5

How could school environment as well as culture and ideology influence secondary school science/mathematics curricula implementation?

The school environment that may affect the implementation of science/mathematics curricula in secondary school may include: the site of the school in a community, the site in terms of its nearness to the market or busy traffic, reverine, desert encroached and the likes, have greater influence with regards to the psychology of both the teacher and the learners. Similarly, secondary schools that are well equipped with necessary scientific infrastructures and facilities as well as adequate and qualified teachers would be expected to actualize adequate implementation of the curricula. In the same vein, cultural and ideological differences noticeable in Nigeria have induced negative influence on science and mathematics curricula implementation in some zones. Closely associated with culture and ideology is religion. This has artificially created a great deal of influence on what takes place in the secondary school science/mathematics. This is the cause of educational dichotomy that hitherto exists between the Northern and Southern parts of the country. The ideology attached to religion and tagged ‘Boko haram’ by certain sect has left a debilitating influence on science/mathematics curricula implementation in some parts (North East) of Nigeria.

5.4 Conclusion

You have learnt in this unit the concept of curriculum implementation. You also learned some unique elements that influence curriculum implementation in primary and secondary schools science/mathematics learning in Nigeria.

5.5 Summary

In this unit, we have learnt that curriculum implementation is all about the processes carried out by specific agents in order to guide the learners to acquire new experiences. The unit also identified the elements that influence curriculum implementation to include the teacher, the parents, the PTA, companies, school environment, culture, etc. The influence of some factors was examined to influence curriculum implementation differently in primary and secondary school levels.

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5.7 Possible Answers To Self-Assessment Exercises

Self-Assessment Exercise 1
What will you consider as the major elements influencing curriculum implementation in Nigeria?

Answer to SAE 1
The major elements influencing curriculum implementation in Nigeria are: the teacher, Learners, resource materials and facilities, interest group (such as parents, PTA, etc) School environment, culture and ideology, instructional supervisors and assessment.

Self-Assessment Exercise 2
How do you see the teacher and the leaners as paramount factors influencing curriculum implementation?

Answer to SAE 2
The teacher is a paramount factor influencing curriculum implementation because he Makes decisions and selects the content to teach from the curriculum. He translates the Curriculum objectives into reality. The teacher also participates fully in the preparation of the curriculum.

On the other hand, the learners play important roles in curriculum implementation because they are responsible for the assimilation of what the teacher transmits from the curriculum. Learners influence what the teacher selects for learning experiences. In curriculum implementation therefore, the learners' background ability is considered.

Self-Assessment Exercise 3
How will you argue the influence of resources and interest groups on curriculum implementation?

Answer to SAE 3
Resources are paramount factors in curriculum implementation. Resources such as Textbooks, instructional materials, laboratories, libraries, classrooms, etc, enable the Teachers and the learners to carry out their roles satisfactorily. Parents-Teachers Association (P.T.A), Old students' association, religious groups, companies, etc provide Financial resources to schools for the purchase of required materials, rehabilitate facilities In schools, and make inputs in the introduction of subjects or contents arising from global challenges in the curriculum.

Self-Assessment Exercise 4
How does the head teacher influence primary school science/mathematics curricula Implementation?

Answer to SAE 4
The head teacher influences primary school science/mathematics curricula implementation by playing a supervisory role. He delegates duties to his assistants to assign staff to classes, prepare the subjects timetable, make instructional materials available, and create conducive learning environment in the school. The head teacher also checks through the teachers' schemes of work, the lesson plans, as well as records of continuous assessment and other necessary records. He does this on daily basis.

Self-Assessment Exercise 5
How could school environment as well as culture and ideology influence secondary school science/mathematics curricula implementation?

Answer to SAE 5
School environment such as the site of the school in a community, the site in terms of its nearness to the market or busy traffic, riverine, desert encroached, etc influence both the teacher and the learners psychologically.

Cultural and ideological difference in Nigeria influence science/mathematics curricula implementation negatively, bringing about educational dichotomy that exists between the northern and southern parts of the country.

TUTOR MARKED ASSIGNMENTS (TMAs)
Module 1
TMA for Unit 1
1. Define educational objective
2. What are the tasks of science/mathematics teacher in achieving learning objectives?

TMA for Unit 2
Criticize the relevance of the objectives of primary school science or mathematics curriculum to the development of Nigerian child.

TMA for Unit 3
Compare and contrast the objectives of junior secondary science and mathematics curricula.

TMA for Unit 4
Justify the relationships existing between the Nigerian senior secondary school science and
mathematics curricula.

Module 2
TMA for Unit 1
Why should learning be sequenced in the curriculum?

TMA for Unit 2
Explain briefly how primary science/mathematics education curriculum is structured.

TMA for Unit 3
Account for the infusion of junior secondary science and mathematics curricula.
T
MA for Unit 4
Compare critically the curriculum structure of Biology and Physics education.

Module 3
TMA for Unit 1
Why do you think demonstration method is adopted for treating primary school science/mathematics curricula?

TMA for Unit 2
Why do you think science/mathematics concepts cannot be taught adequately without laboratory technique in secondary school science/mathematics curricula?

TMA for Unit 3
Select as topic from the subject you teach, identify content and prepare a lesson that can last for 35min.

TMA for Unit 4
Obtain the curricula for secondary school Biology, Chemistry and Physics, select a topic each from SS2 level and state the (i). Performance objectives, (ii). Contents, (iii). Teacher's activities and (iv). Students' activities.

TMA for Unit 5
What will you consider most crucial in order to implement the science curriculum in the class you teach?