



ZIMBABWE

MINISTRY OF PRIMARY AND SECONDARY EDUCATION

CURRICULUM DEVELOPMENT AND TECHNICAL SERVICES

BIOLOGY
SECONDARY SCHOOL LEVEL
FORM 3-6
2015-2022

TEACHER'S GUIDE

Curriculum Development Unit
P.O.BOX MP133
Mount Pleasant
Harare

© All Rights Reserved
Copyright 2015

ACKNOWLEDGEMENTS

The Ministry of Primary and Secondary Education would like to acknowledge the following:

- The Biology National Panel
- United Nations Children's Fund (UNICEF)

TABLE OF CONTENTS

1. Acknowledgements.....	2
2. Organisation of the guide.....	4
3. Introduction.....	5
4. Syllabus Interpretation.....	6
5. Schem cum Plans or Schemes of work.....	8
6. Lesson Plans.....	10
7. record Keeping.....	12
8. Curriculum delivery.....	12
9. Scope of the guide.....	14
10. Scope and sequence.....	16

1.0 ORGANISATION OF THE TEACHERS' GUIDE

This is a document intended for you to realise the expectations of the new curriculum in the Biology learning area. It guides you through the steps necessary for effective curriculum implementation. This teachers' guide is divided into two parts which are Part A and Part B. Part A focuses on the critical documents you should have as a teacher whilst Part B covers curriculum delivery.

- **Part A:** Critical Documents
- **Part B:** Curriculum Delivery

PART A

2.0 CRITICAL DOCUMENTS

Introduction

As a teacher it is important for you to have the following critical documents for effective curriculum implementation. The critical documents are:

- Curriculum Framework
- National Syllabus
- School syllabus
- Scheme cum plan or Schemes of Work and lesson plans
- Learner Profile
- Progress Records
- Register of Attendance

Rationale of the Learning Area

This learning area encourages the learners to employ biological skills in solving real life problems and also emphasizes the link between human activities and the environment. Learners acquire knowledge and skills of inquiry that help them to critically examine issues that arise in their own lives and in the public domain. The skills will be acquired through understanding of biological concepts and practical application. It is therefore important that the learners be afforded an opportunity to study Biology as they prepare for self-reliance and future careers.

Objectives

By the end of this part A on critical documents you should be able to

- a) identify the critical documents
- b) interpret the National Syllabus
- c) develop the School Syllabus
- d) develop preparatory documents
- e) develop progress records

UNIT 1

Curriculum Framework for Primary and Secondary Education 2015-2022

Introduction

This is a policy document that outlines the underpinning national philosophy, principles, learning areas, the description and expectations of Ministry of Primary and Secondary education (MoPSE) at policy level. It outlines what the nation expects you as a Biology teacher to deliver as you go about your duties.

Objectives

By the end of unit 1 you as the teacher should be able to;

- identify key elements of the new curriculum
- demonstrate understanding of the values that define the new curriculum

Key Elements

The following are the key elements of the curriculum framework

- Background
- Principles and values guiding the curriculum
- Goals of the Curriculum
- Learning areas
- Teaching and learning methods
- Assessment and learning
- Strategies for effective curriculum implementation
- The future

UNIT 2

Syllabus interpretation

Introduction

Teachers constitute the backbone of any education system and as such your ability to deliver effective lessons depends on careful planning. Planning begins with syllabus interpretation which forms the basis for development: of

- school syllabus
- scheme of work
- lesson plan

Objectives

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

- interpret the national and school syllabus understanding their components
- construct a school syllabus

Types of syllabi

There are two types of syllabi that is the National Syllabus and the School Syllabus. The national syllabus is a ready made document that is obtained from the ministry whilst the school syllabus is made at school level.

2.1 National Syllabus

Definition

It is an operational document that outlines and specifies the Learning area philosophy, aims and objectives, Learning/teaching concepts and content, suggested methodology and assessment criteria at every level. As a teacher, you should always have a Biology National Syllabus to guide you in your day to day teaching and learning activities.

Elements of the Biology National Syllabus

To interpret the syllabus you need to identify its components and establish links between and among them. Components of the syllabus include;

- Cover page
- Acknowledgements
- Preamble
- Presentation of Syllabus
- Aims
- Syllabus Objectives
- Methodology and Time Allocation
- Topics
- Scope and Sequence
- Competency Matrix
- Assessment
- Glossary/Appendices

Content

Content forms the core of a given learning area. Topics are broken into sub-topics in the competence matrix depending on the learning area. The topics for Biology Forms 3 - 6 are in the respective Biology Syllabi. Refer to the National Syllabi documents.

2.2 School Syllabus

Definition

This is an operational document drawn at school level from the National Syllabus by organising learning experiences taking into account local factors.

Factors influencing drafting

The school syllabus is drafted taking into consideration different factors;

- Level of learner performance (knowledge they already have)- make use of progress reports and evaluation reports
- Relevant facilities and resources (in biology one may consider expensive practicals being done in January capitalizing on using left over materials from previous external examination)
- Time allocation in the official syllabus
- Local conditions that affect the choice and sequencing of topics
- Education technology
- Community influences

Elements

- Topic/content
- Activities
- Time allocation
- Methodology (N.B. learner – centred)
- Instructional or teaching materials
- Assessment

UNIT 3

Scheme cum Plans or schemes of work

This is a document that you as a teacher should draw from the national and school syllabus. You should outline the objectives activities, content, methodologies (see schemes of work/scheme cum plan template on page 9). You should draw your scheme of work/scheme cum plans at least two weeks ahead of lesson delivery date. (Use of ICT tools in drawing the documents is encouraged. However, as a teacher you are urged to avoid ready-made documents and ensure that the schemes suit your learners and their particular environment.)

Components

- Week ending
- Topic/Content
- Objectives
- Competencies
- Source
- Methods
- Activities
- Evaluation

SCHEME OF WORK

Subject : Biology

Form : 3

Term : 1

AIMS

The scheme aims to help learners:

- develop practical skills such as accuracy, objectivity, integrity and enquiry.
- conduct experiments using the scientific methods of enquiry.
- draw biological diagrams in two dimension.
- interpret the relationship between living organisms and their environment.

WEEK ENDING	TOPIC/ CONTENT	OBJECTIVES	COMPETENCIES/ SKILLS/ KNOWLEDGE	SOM/MEDIA	FACILITY /EQUIPMENT	METHODS/ ACTIVITIES	EVALUATION
	<p>Plant and animal cell</p> <ul style="list-style-type: none"> ● Structural and functional units ● Plant and animal cell structure <ul style="list-style-type: none"> - Nucleus - Cytoplasm - Cell membrane - Vacuole - Cell wall - Mitochondrion Chloroplast 	<p>By the end of the week pupils should be able to:</p> <ul style="list-style-type: none"> ● define a cell ● identify parts of the cells ● outline functions of cell organelles <p>compare the structures of plant and animal cells</p>	<ul style="list-style-type: none"> -using the light microscope -Drawing -comparing 	<ul style="list-style-type: none"> ● National syllabus 8.3.1 page 12 ● School syllabus ● Introduction to biology page 20 <p>Media</p> <ul style="list-style-type: none"> ● Chart showing typical plant and animal cell 	<ul style="list-style-type: none"> ● Microscope, on-slides, cover slips ● Bio-viewers 	<ul style="list-style-type: none"> ● Defining a cell. ● Observing cells under the microscope and bio viewers. ● Drawing and labeling plant and animal cells. ● Comparing the structures of plant and animal cells. 	

UNIT 4

Lesson Plans

Definition

This is a detailed daily plan of what you intend to deliver and how it will be done. This is to be used in the event of you having drawn a scheme of work rather than a scheme cum plan. (See Detailed Lesson Plan Template on below)

Components

- Date
- Form
- Time
- Learning Area
- Topics/Content
- Sub topic
- Source of material
- Media
- Equipment
- Number of learners
- Assumed knowledge
- Lesson objectives
- Stage
- Teacher activities
- Learner activities
- Points to note
- Evaluation

DETAILED LESSON PLAN

Date:	22 April 2016
Form:	Form 3
Time:	11.30 -12.40
Learning Area	Biology
Topic/Content:	Plant and Animal cell
Sub-Topic:	Plant Cell
S.O.M:	- National syllabus 8.3.1 page 12 School syllabus -Introduction to biology page 20
Media	Chart showing typical plant cell
Equipment:	Microscope,onions,blank slides, cover slips
Number of students:	30
Assumed Knowledge:	learners know that cells are the building blocks of living things

Lesson Objectives

By the end of the lesson, learners should be able to:

- identify the plant cell
- draw a plant cell as seen under the microscope
- identify parts of the plant cell
- relate the parts of the plant cell to their functions

STAGE	TEACHER ACTIVITIES	LEARNER ACTIVITIES	POINTS TO NOTE
Introduction 5minutes	The teacher explains that bricks are building blocks of buildings and asks learners to identify building blocks of plants	Learners identify cells as the building blocks of plants	Plant cells are building blocks of plants
D e m o n - stration of preparation of slides 10 minutes	The teacher demonstrates how to prepare slides	Learners observe the teacher demonstrating	
Skill Devel- opment Preparing Slides 20 minutes	The teacher instructs pupils to go to their respective workplaces and prepare slides	Learners individually prepare slides	
Skill Devel- opment Viewing through the microscope and Draw- ing 20 minutes	The teacher instructs pupils to view the specimen and draw	Learners view the specimen on slide using a light microscope and draw three adjacent cells	Adjacent cells
Labelling cells 10 minutes	The teacher instructs learners to go into groups	Learners : i. select one cell from their drawings ii. Identify the parts of the plant cell iii. Discuss functions of the parts	-parts of the plant cell -functions of parts
Feedback 10minutes	-The teacher instructs learners to give feedback from their discussion	-feedback by learners	
Conclusion 5 minutes	The teacher asks learners to summarise the following parts of the lesson: -how slides are prepared -functions of parts of cells	Volunteers summarise covered concepts	

LESSON EVALUATION:

Strength:

.....

.....

Areas to be improved:

.....

.....

Unit 5

RECORDKEEPING

Learner Profiles

This is a comprehensive record of the learner's social, economic and personal background and learning progress. Profile assessment is a quality assessment tool designed for a variety of learners to determine their strengths and identify areas of improvement. As a teacher, you should carry out profiling to track learner behaviour, knowledge, attitudes, aptitudes, skills, values and performances on an on-going basis. This assessment informs teaching and learning process and contributes to learner profile.

Progress Record

You should have a progress record to capture learner performance. When compiling this document you should exercise a high level of professionalism as it will be used for the learners' continuous assessment component.

Attendance Register

This is a critical document you should have as a teacher to track and record your learners' lesson attendance. It may also help to explain the performance of the learners.

Conclusion

The critical documents are an indispensable component of the new curriculum. Their importance in preparation and evaluation of learning cannot be over emphasised.

3.0 PART B: CURRICULUM DELIVERY

1.1 INTRODUCTION

This section elaborates on the following aspects of the biology learning area; content, objectives, methodology, learning teaching materials, evaluation/assessment and class management.

Content

Under every topic in the syllabus the content to be covered is outlined. It is important for you to pay particular attention to the content that is supposed to be covered.

Objectives

Objectives should be SMART (specific, measurable, attainable, result oriented and time framed). They are more specific statements that include both an action verb and a content reference. They are a clear statement of intended learning outcome.

Methodology

As a teacher you should use the interactive, multi-sensory, learner centred and practical approaches. Principles of independence, team work, completeness and stimulation must be applied to enhance the learning – teaching process. The learners should be allowed to apply their experiences, knowledge, skills and attitudes in the learning of the subject. The following are the suggested methods:

- Experimentation
- Discovery
- Demonstrations
- Problem solving
- Discussions
- E-learning
- Group work
- Educational tours
- Project based learning
- Research
- Observations
- Simulations

Teaching-learning materials

To enhance learning as a teacher you are supposed to incorporate teaching learning materials that promote pupil participation and discovery of scientific phenomenon .The material should create an environment that maximizes learner –learner interaction.

ICT tools
Print media
Real objects
Apparatus
Models

9.0 ASSESSMENT

9.1 Scheme of Assessment

Forms 3 to 4 Biology assessment will be based on 40% continuous assessment and 60% summative assessment. The syllabus' scheme of assessment is grounded in the principle of equalisation of opportunities hence does not condone direct or indirect discrimination of learners.

Arrangements, accommodations and modifications must be visible in both continuous and summative assessments to enable candidates with special needs to access assessments and receive accurate performance measurement of their abilities. Access arrangements must neither give these candidates an undue advantage over others nor compromise the standards being assessed.

Candidates who are unable to access the assessments of any component or part of component due to disability (transitory or permanent) may be eligible to receive an award based on the assessment they would have taken. For details on assessment refer to the Biology National Syllabus

Evaluation

You are supposed to evaluate at the end of each lesson and in the case of the scheme at the end of the week. When you evaluate you are looking at the extent to which the objectives have been achieved and this is usually measured by learners' performance. You should also evaluate the teaching –learning methods, this encompasses the strength and weaknesses of the methods used. You should evaluate the suitability of the equipment used. It is also important to evaluate the timing of activities and class management. You should also bring out the way forward in terms of areas of improvement and areas you can capitalise on.

Class Management

For you to be able to achieve your objectives and carry out all planned work class management is of paramount importance especially given the new paradigm where all activities are learner centred. You should give clear instructions on how learners will carry out their activities, the size of their groups, how they will move to activity to activity ,the observations that they are supposed to make and the safety precautions that they are supposed to observe. You are supposed to fairly distribute tasks so as to involve all learners. You are also supposed to give equal treatment to all learners.

UNIT 6

SCOPE OF THE GUIDE

Topics to be covered Form 3-4

Safety, Careers and Branches in Biology

Chemicals of life

Cells and cellular activities

Enzymes

Plant Science

Animal Science

Microbiology and Biotechnology

Genetics

Biodiversity

Ecosystems

Health and Diseases

Topics to be covered Form 5-6

Cell Structure and Function

Biological Molecules and Water

Cell and Nuclear Division

Genetic Control

Gene Technology

Inherited Change and Evolution

Energetics

Transport Systems

Nervous Control

Reproduction

Ecology

Biodiversity

Human Health and Diseases

Topic: Plant and animal cell

Sub topic: Plant cell

- Content: Structural and functional unit of plants
- Plant cell structure
 - Nucleus
 - Cytoplasm
 - Cell membrane
 - Vacuole
 - Cell wall
 - Mitochondrion
 - Chloroplast

Methodology and Activities

Preparation of slides using onion, the specimens can be stained using methylene blue or iodine.

Viewing of cells using the light microscope

Drawing cells as seen under the microscope.

Teaching and learning material

Microscope, onion, iodine solution, methylene blue/iodine, blank slides, cover slips,

Evaluation

To what extent have the objectives been achieved?

How effective were the teaching – learning activities

How effective was your class management in terms of time management, order and clarity of instructions

How the learners responded

Conclusion

This guide is not exhaustive, your initiative and creativity is of paramount importance in the successful implementation of the new curriculum. You need to embrace the new paradigm which puts the learner at the centre of all class activities and encourages learning that is relevant to the learner's environment and the outcome should move Zimbabwe to a higher level in terms of socio-economic status. In order to foster competency development for further studies, life and work, the following cross-cutting priorities have been taken into consideration: gender and inclusivity, environmental issues, information and communication technology tools, children's rights and responsibilities, disaster risk management, life skills, collaboration, sexuality, HIV and AIDS, respect for life and heritage studies

Annexure:**Scope and sequence**

TOPIC	FORM 3	FORM 4
7.1 Safety, Careers and Branches in Biology	<ul style="list-style-type: none"> ● Safety in the laboratory ● Branches of Biology ● Careers 	<ul style="list-style-type: none"> ● Safety labels and symbols
7.2 Chemicals of life	<ul style="list-style-type: none"> ● Constituents and identification of : <ul style="list-style-type: none"> - Water - Carbohydrates - Proteins - Lipids - Nucleic acids 	Classification ,chemical structure and uses: <ul style="list-style-type: none"> - Carbohydrates - Proteins - Lipids - Nucleic acids
7.3 Cells and cellular activities	<ul style="list-style-type: none"> ● Plant and animal cell structure ● Cell specialization ● Cellular transport 	-
7.4 Enzymes	<ul style="list-style-type: none"> ● Nature and properties of enzymes ● Mode of action 	<ul style="list-style-type: none"> ● Industrial application of enzymes
7.5 Plant Science	<ul style="list-style-type: none"> ● Nutrition ● Productivity ● Transport 	<ul style="list-style-type: none"> ● Reproduction ● Coordination and response
7.6 Animal Science	<ul style="list-style-type: none"> ● Nutrition ● Gaseous exchange ● Respiration ● Transport ● Immunity ● Sexual reproduction in humans 	<ul style="list-style-type: none"> ● Productivity ● Homeostasis ● Coordination and response ● Endocrine system ● Skeletal system
7.7 Microbiology and Biotechnology	<ul style="list-style-type: none"> ● characteristics Types and economic importance of microorganisms 	-Recombinant Gene Technology
7.8 Genetics	<ul style="list-style-type: none"> ● Chromosomes and Genes ● Monohybrid inheritance ● Mutations 	<ul style="list-style-type: none"> ● Variation ● Selection
7.9 Biodiversity	<ul style="list-style-type: none"> ● Classification 	<ul style="list-style-type: none"> ● Threats and conservation measures
7.10 Ecosystems	<ul style="list-style-type: none"> ● Ecosystems ● Natural systems ● Artificial systems 	<ul style="list-style-type: none"> ● Management of ecosystems
7.11 Health and Diseases	<ul style="list-style-type: none"> ● Health ● Diseases (Infectious and non-infectious) 	<ul style="list-style-type: none"> ● Drug use and abuse

TOPIC	FORM 3	FORM 4
7.1 Cell Structure and Function	<ul style="list-style-type: none"> ● Microscopy ● Plant and Animal Cells ● Organelles and their functions ● Eukaryotic and Prokaryotic cells ● Movement of substances into and out of cells 	---
7.2 Biological Molecules and Water	<ul style="list-style-type: none"> ● Carbohydrates ● Lipids ● Proteins ● Water 	---
7.3 Cell and Nuclear Division	<ul style="list-style-type: none"> ● The Cell cycle ● Mitosis ● Meiosis 	---
7.4 Genetic Control	<ul style="list-style-type: none"> ● Nucleic Acids ● Structure and replication of DNA ● Protein synthesis 	---
7.5 Gene Technology	---	<ul style="list-style-type: none"> ● Insulin Production ● Genetic Screening and Finger Printing ● Gene Therapy ● Benefits and Hazards of Gene Technology ● Ethical implications of Gene Technology
7.6 Inherited Change and Evolution	<ul style="list-style-type: none"> ● Nature of Gene ● Monohybrid and Dihybrid Crosses 	<ul style="list-style-type: none"> ● Natural selection ● Artificial selection
7.7 Energetics	<ul style="list-style-type: none"> ● ATP Structure and Synthesis ● Photosynthesis ● Respiration 	---
7.8 Transport Systems	<ul style="list-style-type: none"> ● Structure and Mechanisms of transport systems in plants 	<ul style="list-style-type: none"> ● Mammalian circulatory system
7.9 Nervous Control	---	<ul style="list-style-type: none"> ● Need for communication ● Action potential ● Cholinergic synapse
7.10 Reproduction	---	<ul style="list-style-type: none"> ● Asexual Reproduction in Plants ● Sexual Reproduction in Plants ● Sexual Reproduction in Humans

TOPIC	FORM 3	FORM 4
7.11 Ecology	---	<ul style="list-style-type: none"> ● Levels of ecological organization ● Nitrogen cycle ● Effects of human activities on ecosystems ● Conservation
7.12 Biodiversity	---	<ul style="list-style-type: none"> ● Classification ● Importance of Biodiversity
7.13 Human Health and Diseases	<ul style="list-style-type: none"> ● Drug and substance abuse ● Global distribution of Diseases ● Immunity 	---

