Acknowledgement

The ministry of primary and secondary education would to acknowledge the following:

- Physics National Panel
- United Nations Children’s Fund (UNICEF)
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1.0 ORGANISATION OF THE TEACHERS’ GUIDE

This is a document intended for you, to realise the expected conduct towards the fulfillment of the new curriculum demands in Physics learning area. It guides you to understand and engage in the participation to implement the new curriculum.

This teachers’ guide is divided into two parts.

Part A focuses on the critical documents you must have as a teacher. Part B deals with curriculum delivery which has the content, objectives, methodology, instructional materials, class management and assessment.

- 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 critical documents for effective curriculum implementation in the Physics learning area.

Rationale
Modern day economies, Zimbabwe included, are driven by Technology and Physics concepts form part of the basis. The study of Physics enables learners to be creative and innovative in industry and society that can promote the application of Physics in industrial processes for value addition. The learning of Physics concepts promotes value addition and beneficiation of natural resources and the harnessing of available opportunities for enterprise skills.

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

   a) Identify the critical documents
   b) Show understanding of each document
   c) Interpret the National Syllabus
   d) Develop the school syllabus
   e) Develop preparatory documents
   f) Develop progress records

You are expected to have the following critical documents

- Curriculum Framework
- National Syllabus
- School syllabus
- Scheme cum plan or Schemes of Work and lesson plans
- Progress Records
- Register of Attendance
- Learner profiling guide
UNIT 1

Curriculum for Primary and Secondary Education

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 government expects you to implement.

Objectives

By the end of this unit you should be able to:
- identify key elements of the new curriculum
- demonstrate understanding of the values that define the new curriculum

Key Elements of the Curriculum
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
A syllabus is a key document to you as a teacher and as such your ability to deliver effective lessons depends on careful planning. Planning begins with national syllabus interpretation which forms the basis for:

- Development of school syllabus
- Development of scheme of work
- Development of lesson plan

Objectives
By the end of this unit on syllabus interpretation you should be able to:

- Interpret the national syllabus
- Create the school syllabus

TYPES OF SYLLABI
There are two types of syllabi, that is, the National Syllabus and the School Syllabus. The national syllabus is distributed by the ministry whilst the school syllabus is constructed at departmental level in your physics learning area.

2.1 National Syllabus

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

Elements of the Physics National Syllabus
The national syllabus includes the following topics:

- Cover page
- Acknowledgements
- Preamble
- Presentation of Syllabus
- Aims
- Syllabus Objectives
- Methodology and Time Allocation
- Topics
Content

The content of the national syllabus are in the respective documents:

Refer to Physics Syllabus Form 3-4 and Form 5-6

School Syllabus

Definition

It is the interpretation of the national syllabus taking into account local school factors. The Physics school syllabus must be drawn at school level from the National Syllabus by reorganising content taking into account local factors. (see section on Syllabus Interpretation)

Factors Influencing Drafting of the School Syllabus

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 physics 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 of the School Syllabus

The following are the key elements of the school syllabus:

- Topic/content
- Activities
- Time allocation
- Methodology (NB learner – centred)
- Instructional or teaching materials
UNIT 3

SCHEMES OF WORK

Definition

Scheme of work is a result of your interpretation of the syllabus which shows the content to be covered and its sequencing. This is a document that you as a teacher should draw from the national and school syllabus.

You should outline the objectives, activities, content and methodologies (see schemes of work/scheme cum plan template on page …). 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, avoiding the temptation to copy ready-made documents, but ensuring to make a document that suits your learners).

Components of Schemes of Work

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

EXAMPLE

Aims

This scheme aims at

1. Introducing students to physical quantities
2. Relating physical quantities to measuring units
3. The use of measurement in the community
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<th>WEEK ENDING</th>
<th>TOPIC/ CONTENT</th>
<th>METHODS/ACTIVITIES</th>
<th>FACILITY /EQUIPMENT</th>
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<tr>
<td>13-12-2016</td>
<td>Measurement of physical quantities.</td>
<td>Demonstration, Command, Practice, Guided Discovery, Group work, Pair work, Tasking</td>
<td>Metre rule, Measuring tape, Ticker tape, Stopwatch, Ammeter, Voltmeter</td>
<td>National Syllabus page..., School syllabus page..., The web for example <a href="http://youtube.com">http://youtube.com</a> materials</td>
<td>Scientific attitudes, Decision making, Accurate observation, Being meticulous, Consistency, Objective</td>
<td>By the end of the lesson pupils should be able to accurately measure results, critically analyse results, apply the results wherever appropriate, use SI units.</td>
</tr>
<tr>
<td>13-12-2016</td>
<td>Use of S.I. units</td>
<td>Collecting materials, Measuring the dimensions of the materials, Computer simulations on projectiles</td>
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<tr>
<td>13-12-2016</td>
<td>Describing natural and man-made materials</td>
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</tbody>
</table>
UNIT 4

LESSON PLAN

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 page…..)

Components of a Lesson Plan

The lesson plan consist of the following components:

- Date and time
- Learning area
- Topic
- Class
- Sources of materials and/or media
- Textbooks
- Assumed knowledge
- Objectives
- Competencies
- Introduction
- Lesson development
- Conclusion
- Evaluation

EXAMPLE

Date: 22 April 2016
Level: Form 3
Time: 10:40-11:50
Number of students: 70
Learning Area Physics
Topic/Content: Physical quantities
Sub-Topic: Measurement
S.O.M: National syllabus 8.3.1 page 12
School syllabus
Textbook page ….
Media Various measuring instruments
Equipment: Objects and apparatus
Assumed Knowledge: learners are able to identify dimensions or physical quantities of objects.

Lesson Objectives
By the end of the lesson, learners should be able to:
- Measure physical quantities that is length and mass
- Read an instrument scale to the nearest fraction of a division
- Identify S.I. units for length and mass

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<tr>
<th>STAGE/TIME</th>
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<th>LEARNER ACTIVITIES</th>
<th>POINTS TO NOTE</th>
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<tr>
<td>Introduction 5 minutes</td>
<td>Monitors activities in groups</td>
<td>In pairs they estimate length and mass of given blocks.</td>
<td>Units of length and mass</td>
</tr>
<tr>
<td>15 minutes</td>
<td>Facilitates presentations</td>
<td>Each pair presents on estimations and a rival pair measures the estimated blocks.</td>
<td>accuracy</td>
</tr>
<tr>
<td>10 minutes</td>
<td>Facilitates discussion</td>
<td>Compare estimates versus accurate measurements</td>
<td>Note sources of errors in measuring.</td>
</tr>
<tr>
<td>5 minutes</td>
<td>Monitors order and attentiveness</td>
<td>Watch a video on how to take measurements</td>
<td>Measuring to the nearest fraction</td>
</tr>
<tr>
<td>Skill Development 30 minutes</td>
<td>Rotates materials to be measured</td>
<td>Practice measuring using different instruments and recording results</td>
<td>Use of measuring instruments</td>
</tr>
</tbody>
</table>
| Conclusion 5 minutes | Corrects and concretise main points | Selected pupils summarise the lesson | - How to measure  
- Units  
- accuracy |
Unit 5

RECORD – KEEPING

Definition
Records are critical documents about teaching-learning process which you must keep as a teacher. They should be accurate and up to date. The following are some of the reasons why you should keep records:

- They help you to track learner’s performance
- They help you in planning and re-adjustment of plans
- They are essential for assessment
- They are the basis for counseling

In addition to critical documents you are expected to keep the following records in your file:

- Class attendance register
- Teacher’s Guide
- Social record
- Progress record
- Remedial record
- Asset and stock control registers
- Circulars

Conclusion
All these documents are important for your delivery of the new curriculum.
3.0 PART B

Curriculum Delivery

Introduction

This section covers content, objectives, methodology, learning-teaching materials, evaluation and assessment, and class management.

3.1 Objectives (examples from forms 3 and 4 topics)

3.2 Content

3.3 Methodology (examples)

The following approaches and methods are recommended in the teaching and learning of Physics.

Approaches

You are the facilitator and the learner is the doer. Minimize methods that makes a learner a passive participant. Use learner-centered and interactive approaches, which include discovery, inquiry and problem-solving.

These approaches foster scientific skills such as observation, accuracy, objectivity, honest and group skills. They include demonstrations, field work, games, simulations, debates, laboratory work and experiments, group work and discussions, role-play, case studies, project based learning and educational tours.

Objectives

Syllabus and learning objectives should be SMART. They are more specific statements that include both an action verb and a content reference. They should provide a clear statement of intended learning outcomes. In the formulation of objectives keep in mind the following questions:

- What do you want your learners to learn? (What are the learning outcomes which you expect from the learning and teaching process?)
- What assignments, classroom activities, and pedagogical approaches will help your learner acquire the identified knowledge, skills, or attitude changes (competences)?
- How will you determine that learners have accomplished what you set out to teach them? (How will you evaluate their achievements?)

3.4 Teaching-learning Materials

Teaching-learning materials are the tools you should use during the learning and teaching process. Learning materials should concretise the concepts and engage the learner. The following should help you choose appropriate teaching-learning material.
capture learners’ interest and create virtual reality.

• promote meaningful communication, hence effective learning.

• ensure better retention, thus making learning more permanent.

• provide direct or first-hand experience with the realities of the social and physical environment.

• help overcome the limitations of the classroom

• stimulate and motivate students to learn.

• help develop interests in other areas of learning.

• encourage active participation, especially if learners are allowed to manipulate materials used.

Types of Teaching-Learning Materials

Visual materials

Three Dimensional Materials

• Objects: real things—e.g. Jars, cooking utensils etc.

• Models: are recognisable representation of a real thing

• Specimens: are objects which are representative of a group or a class of similar objects e.g. flowers, fish, frogs etc.

• Printed materials: Textbooks, Workbooks, Handbooks and Modules

• Chalkboards

• Flannel or felt boards

• Bulletin boards

• Still pictures: Non-projected (photographs, illustrations) and Projected (slides, filmstrips, overhead projectors)

• Graphics: Charts, Graphs, Maps and globes, Posters and diagrams.

• Audio Aids: Radio and Recorded audio

Audio-Visual Teaching-learning Materials

• Motion pictures such as Television and video clips

3.4 Assessment and Evaluation

Assessment

Assessment is both continuous and summative (see the physics 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.

**3.6 Class Management**

This is the process of planning, organizing, leading and controlling class activities to facilitate effective and efficient learning. This should help you to create an effective learning environment, motivate the learners, maintain class discipline and supervise class activities. Classroom organisation is critical for an effective learning environment. Classroom management covers: physical environment, emotional environment, grouping the learners, class control and discipline and supervision.
SCOPE OF THE GUIDE

Topics to be covered

1.0 Measurement and physical quantities
2.0 Kinematics
3.0 Forces
4.0 Machines
5.0 Mechanical structures
6.0 Work, energy and power
7.0 Thermal physics
8.0 Internal combustion engines
9.0 Waves
10.0 Optics
11.0 Electricity
12.0 Magnetism
13.0 Electromagnetism
14.0 Electronics
15.0 Atomic and nuclear physics

Topic/: 1.0 Measurement and physical quantity

a. Measurement and base quantities
b. Measurement and derived quantities
c. SI Units

Sub topic: Measurement and base quantities

Objectives

By the end of the lesson pupils should be able to;

- measure length and mass
- read an instrument scale to the nearest fraction of a division
Content
Measuring length using meter rule, vernier calipers, and micrometre screw gauge

Methods and Activities
The learners measure the length using meter rule, vernier calipers, and micrometre screw gauge.
The learners measure mass using triple beam balances and electronic balances.
Learners to tabulate results.

Materials
Meter rule
Vernier calipers
Micrometre screw gauge
Electronic balance
Triple beam balance

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.

The learning of Physics should be done with the following cross cutting issues in mind: inclusivity, environmental issues, indigenous knowledge system, financial literacy, enterprise education, gender, HIV and life skills, child protection, team work, food security, safety health issues and disaster risk management.
# Annexure scope and sequence

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  • Derived quantities  
  • Use of S.I. units | • Definition of voltage, resistance and current  
  • Experiments to measure voltage, current and determine resistance for ohmic conductors |
| **1.1 Measurements** | • **1.0 MEASUREMENT AND PHYSICAL QUANTITIES** | • Definition of voltage, resistance and current  
  • Experiments to measure voltage, current and determine resistance for ohmic conductors |
| **1.2 Scalars and vectors** | • Definitions and examples  
  • Resultant of coplanar vectors using graphical method  
  • Applications | |
| **2.0 KINEMATICS** | • Definitions of terms  
  • Equations of linear motion and application | |
| **2.1 Speed, velocity, distance, displacement and acceleration** | • Drawing and interpretation of graphs | |
| **2.2 Graphs of motion** | • Definition of free fall  
  • Calculations and applications | |
| **2.3 Motion under gravity** | • Types of forces  
  • Interpretation of force extension-graphs | • Application of forces on beams, trusses and mechanical large structures |
| **3.0 FORCES** | • Definitions of weight, momentum and inertia  
  • State and apply Newton’s laws of motion  
  • Circular motion | |
| **3.1 Effect of force on materials** | • Effects of friction  
  • Methods of friction  
  • Centripetal acceleration and force | |
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  • Turning effect of a force  
  • Principles of moments  
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| **3.3. Friction and circular motion** | • Definitions of terms  
  • Determination of centre of mass  
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