ZIMBABWE

MINISTRY OF PRIMARY AND SECONDARY EDUCATION

CURRICULUM DEVELOPMENT AND TECHNICAL SERVICES

STATISTICS

SECONDARY SCHOOL LEVEL
FORM 3-6
2015-2022

TEACHER'S GUIDE

ACKNOWLEDGEMENTS

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1.0 ORGANISATION OF THE TEACHERS` GUIDE

This teachers' guide was designed taking into cognisance the need to guide you teachers in developing and employing teaching methods in Statistics. The guide draws from the Statistics syllabus. It also clarifies aspects contained in the syllabus. This guide assists the teacher to explore teaching strategies that help the learner to acquire necessary skills and competencies. As a teacher you should be able to go beyond this guide by reading relevant material.
This Teachers' Guide is divided into two parts:

Part A - Critical Documents

- Curriculum Framework
- National syllabus
- School syllabus
- Scheme of work
- Lesson plan
- Progress records
- Learner Profile
- Attendance Register

Part B - Curriculum Delivery

- Content
- Objectives
- Methodology
- Teaching-learning materials
- Assessment and Evaluation
- Class Management
- Scope of the Guide

2.0 PART A: CRITICAL DOCUMENTS

Introduction

The critical documents assist you the teacher in handling the Statistics learning area. As a teacher you need to have the following critical documents in order to deliver the curriculum effectively. You should have the following:

- Curriculum Framework
- National Syllabus
- School syllabus
- Schemes of Work/Scheme Cum Plan
- Lesson Plans
- Learner Profile
- Records
- Register of Attendance

Rationale

The aim is to enable teachers to apply suitable teaching methods that allow learners to explore mathematical and scientific concepts as they are central to most facets of everyday life and enterprise skills. The learning area plays a pivotal role in Science, Technology, Engineering and Mathematics (STEM). The teachers` guide promotes problem solving, innovativeness, confidence, self-actualisation and classroom based research.

It is therefore important as a teacher to expose learners to mathematical and scientific knowledge. This enables learners to manipulate objects and interact with their environment.

Objectives

It is hoped that after going through this part, you will be able to:

- gain an insight into the philosophy of education underpinning the curriculum
- manage your class effectively
- mobilise the teaching and learning resources
- prepare engaging and appropriate teaching aids
- track the learner's progress during the learning process

UNIT 1

Curriculum for Primary and Secondary Education (2015-2022)

Introduction

This is a policy document that outlines underpinning principles, national philosophy, learning are-as, the description and expectations of Ministry of Primary and Secondary Education (MOPSE) at policy level. It prescribes what the government expects you to deliver as you go about your duties. The Zimbabwe Curriculum framework sets out the common aims and objectives of the education system and the specific features of different education levels, thereby providing the basis for transparent relationships between schools, parents, and local communities. It also provides guidance to schools and education administrators in the organization, management and evaluation of the effectiveness of the school activities. Schools are encouraged to actively engage, as learning organisations, in providing diversified opportunities for all learners to develop the knowledge, key skills and attitudes defined in this framework. This framework is intended to be the main reference document informing the development of syllabuses, revision of syllabuses, development and use of learning resources and the creation of guidelines for in-service teacher training and support. This Curriculum Framework sets out what learners are expected to know, understand, value and be able to do as a result of their learning experiences in schools and non-formal education settings from Early Childhood Development (ECD) to secondary level. Its fundamental purpose is to provide a structure around which schools can build educational programmes that ensure learners achieve desired outcomes. This framework identifies learning areas for all learners. It is intended to guide schools and teachers, stakeholders and parents over the curriculum process in a rapidly changing environment.

Objectives of the Curriculum:

The Curriculum was developed to:
- promote and cherish the Zimbabwean identity
- Prepare learners for life and work in a largely agro-based economy and an increasingly globalised and competitive environment.
- foster life-long learning in line with the opportunities and challenges of the knowledge society
- Prepare learners for participatory citizenship, peace and sustainable development
- Prepare and orient learners for participation, leadership and voluntary service

Key Elements

The Curriculum of Zimbabwe is made up of the following key elements:
- Background
- Principles and values guiding the curriculum
- Goals of the curriculum
- Learning areas
- Teaching and learning methods
- Assessment and learning
- Strategies for curriculum implementation
- The future

Unit 2

SYLLABUS INTERPRETATION

Introduction

Syllabus interpretation is the process of making sense out of the syllabus. Interpretation is about finding meaning. It is the process of unpacking the syllabus, analysing it and synthesising it.

Objectives

As a teacher you therefore need to be familiar with the two syllabuses, that is the national syllabus and the school syllabus. This will assist you in your lesson delivery.

Types of School syllabuses

2.1   National Syllabus

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 form level. As a teacher you should always have it and use it to guide you in your day to day teaching and learning activities.

Aims: general direction in which you should be guiding your learners (long term)

Objectives: learner behavior after treatment

Assessment objectives: examination oriented (what is to be tested)

Content: topics or aspects to be covered

Methodology: teaching approaches to achieve desired learning outcomes

Learner-centred approaches allow learners to practice skills learnt
Examination format: how learners will be assessed

2.2   School Syllabus

This must be drawn from the National Syllabus by reorganising content taking into account local factors. It is a breakdown of the national/official syllabus to suit the contextual environment into which the school is located but without changing the content of the national syllabus. This document is drafted at school level by the teachers.
Influenced by:
  - Level of learner performance (knowledge they already have)
  - Facilities and funds available
  - Time allocation in the official syllabus
  - Local conditions that affect the choice and sequencing of topics
  - Supply of textbooks and other teaching materials
  - Education technology
  - Community influences

Structure of School Syllabus

- Aims: broad indication of what the learners should learn
- Objectives: learner behavior at the end of the teaching-learning experience

(competencies)

- Topics/Activities (Content)
- Methodology (Learner – Centred)
- Instructional Or Teaching Materials
- Assessment/Evaluation

UNIT 3

SCHEMES OF WORK/ SCHEME CUM PLANS

SCHEME OF WORK (WEEKLY BREAKDOWN)

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

- describe the essential components of a scheme plan
- develop a scheme plan
- explain the advantages of writing down your plan
- realise the merits of planning your lessons well in advance

Definition:

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. A scheme of work is therefore a plan of action, which should enable you to organize teaching activities ahead of time. It is a summarized forecast of work, which you consider adequate and appropriate for the class to cover within a given period from those topics, which are already set in the syllabus.

COMPONENTS

The components of a scheme of work include the following aspects:

- Level of learners: state the level (grade/form) of learners you are scheming for.
- Learning Area: indicate the learning area you are scheming for
- Week ending: the date should be clearly indicated
- Topic/Key concepts/Skills: topics should follow the order, which they are supposed to be taught, from simple to complex.

Objectives: each lesson should have objectives, which pinpoint the anticipated learning behaviour of the learners. The objectives must be stated in a manner that there is a measurable aspect manifested at the end of the lesson for example, learners should be able to conduct fire drills.

FORM 3 SCHEMES OF WORK

Learning area: Statistics form 3

Aims
- acquire mathematical skills to solve problems related to industry and technology
- further develop mathematical concepts and skills for higher studies
- use mathematical skills in the context of more advanced techniques such as research
- apply Statistics concepts and techniques in other learning areas
- develop an appreciation of the role of mathematics in personal, community and national development (Unhu/Ubuntu/Vumunhu)
- use I.C.T tools effectively to solve mathematical problems
- apply Statistics mathematical skills and knowledge in relevant life situations
- enhance confidence, critical thinking, innovativeness, creativity and problem solving skills for sustainable development

WEEK ENDING	TOPIC/ CONTENT	OBJECTIVES	COMPETENCIES/ SKILLS/ KNOWLEDGE	MEDIA	SOM	METHODS/ ACTIVITIES	EVALUATION
16/12/16	Data collection and presentation Types of data	By the end of the lesson learners should be able to: • name the types of data in statistics • compare different types of data	• critical thinking • analytical thinking • problem solving	• ICT tools • Relevant texts • Braille material and equipment • Talking books	• Statistics National Syllabus page 14 • Statistics Pupils Book 3 page 61-63	• Discussing the types of data in statistics • Explaining the difference between two given types of data • Classifying data according to type	Should show strength and weaknesses of methodology, and whether objectives were achieved. Map the way forward. This forms the basis for remedial work
	Methods of collecting data	• explain methods of collecting data • use the methods to collect data	• critical thinking • analytical thinking • problem solving	• ICT tools • Relevant texts • Braille material and equipment • Talking books	• Statistics National Syllabus page 14 • Statistics Pupils Book 34 page 61-63	• Discussing and demonstrating methods of collecting data • Designing and administering: - Questionnaires - Interview guides • Carrying out experiments such as tossing a coin or throwing a die Observing events and recording outcomes	Should show strength and weaknesses of methodology, and whether objectives were achieved. Map the way forward. This forms the basis for remedial work

Week ending	Topic/ Content	Objectives	Methodology and Activities	Competencies (skills, knowledge and attitudes)	References/ Source of material	Media/ Resources
	Data collection and presentation Lesson 1 Types of data	By the end of the lesson learners should be able to: ● explain methods of collecting data ● use the methods to collect data	**Introduction** -recap of the previous lesson Step 1 :class discussion -Learners discuss types of data step 2 : group work -explaining difference between the two given types of data Step 3 Demonstration -learners classify data according to type Step 3 Individual work conclusion - learners and the teacher summarises the lesson by highlighting main points	● critical thinking ● analytical thinking ● problem solving	● Statistics) National Syllabus page 5 ● Statistics Pupils Book 3 page 61-63	● ICT tools(overhead projector and laptop to display laws of indices) ● Print media

Week ending	Topic/ Content	Objectives	Methodology and Activities	Competencies (skills, knowledge and attitudes)	References/ Source of material	Media/ Resources
	Lesson 2 Methods of collecting data		**Introduction** Recapping of the concepts of the previous lesson **Step 1 :** Discussion -class discussion on the methods of collecting data **Step 2:** Group work Learners design questionnaire on their topics of choice **Step 3 :** Demonstration Learners demonstrate how to use interview guides in collecting data **Step 4 :** individual work learners write exercise on methods of collecting data conclusion -revising selected questions	● critical thinking ● analytical thinking ● problem solving	● Statistics) National Syllabus page 5 ● Statistics Pupils Book 3 page 64	● ICT tools(overhead projector and laptop to display laws of indices) ● Print media

UNIT 4: LESSON PLANS

Definition

This is a detailed daily plan of what you intend to deliver during the lesson. This is to be used in the event of you having drawn a scheme of work rather than a scheme cum plan.
Components of a lesson plan

A lesson plan is made up of the following components:
- Date
- form
- Time
- Learning area
- Topic/content
- Sub-topic
- SOM
- Teaching and learning aids
- Number of learners
- Assumed knowledge
- Lesson objectives
- Lesson steps
- Evaluation

Example of a lesson plan

The following is an example of a lesson plan drawn from the scheme of work above.

Detailed Lesson Plan

Date :   15 December 2016
Form :   3
Time: 11.30 -12.00
Learning Area   Statistics forms 3-4
Topic/Content: Data collection and Presentation
Sub-Topic: Types of data
S.O.M: Statistics forms 3-4   National
                                Syllabus page 14
Teaching and learning aids: ICT tools ICT tools, Relevant texts ,Braille material and
                                equipment Talking books

Number of learners: 45
Assumed Knowledge: Learners are able to define data

Lesson Objectives
By the end of the lesson, learners should be able to:
- name the types of data in statistics
- compare different types of data

INTRODUCTION: recap of the previous lesson

Stage 1: class discussion- Learners discuss types of data
Stage 2: group work -explaining difference between the two given types of data.

Stage 3: Demonstration -learners classify data according to type
Stage 4: individual written work on types of data
Conclusion: learners and the teacher summarises the lesson by highlighting main points

LESSON EVALUATION:

Strength: ....
....
....
....

Weaknesses: ....
....
....
....

Way forward: ....
....
....
....

Unit 5

RECORD KEEPING

Records are critical documents about the teaching – learning process, which you must keep as a teacher

They include:
- Syllabuses (National and School)
- Staff and pupil details
- Examination documents
- Mark lists
- Stock control registers

OBJECTIVES
By the end of this unit, you should be able to:
- identify the various records you are expected to keep
- prepare accurate records
- Interpret information from records to promote learning
- Maintain and keep records safely
- Appreciate the need to update records regularly

TYPES OF RECORDS
- Official syllabuses
- School syllabuses
- Records of staff details
- Records of learner details
- Supervision records
- Files, circulars, handouts, past exam papers
- Minutes of meetings
- Inventory of resource materials
- Stock control registers
- Learner Profiles
- Attendance Register

CONCLUSION

Effective teaching and learning requires you to have all the critical documents and to use them as required. You need to scheme, plan and prepare for your lessons well in advance. Furthermore, you need to familiarize yourself with the Ministry Of Primary and Secondary Education's Curriculum Framework.

PART B CURRICULUM DELIVERY

Introduction

This section comprises of the objectives, content, methodology, teaching-learning materials, class management, evaluation and assessment. This assists you as a teacher in lesson delivery.

OBJECTIVES (EXAMPLES)

By the end of this unit, you should be able to:
- select appropriate teaching methods for your lessons
- design meaningful and effective instructional material
- use a variety of learner-centred approaches
- plan and organise educational tours
- help pupils carry-out projects or experiments
- make good quality aids from available resources

(Types: charts, chalkboard, whiteboard, computers, slides, films, videos, flannel graph, textbooks)

CONTENT
The following is the content you should cover :

- Introduction to Statistics
- Data Collection and Presentation of data
- Measures of Central Tendency
- Measures of Dispersion
- Sampling and estimation
- Probability
- Random Variables
- Errors
- Index Numbers
- Time Series
- Permutations and combinations
- Bivariate data
- Discrete random variables
- Continuous distributions
- Linear combinations of random variable
- Statistical inference
- Hypothesis testing

METHODOLOGY

As a teacher it is important for you to use problem solving and learner–centred approaches. You are the facilitator and the learner is the doer. You should select appropriate teaching methods for your lessons. They should be varied and motivating. You should select one or several methods depending on:
- The subject matter
- Instructional objectives
- The learner
- Your personality
- Learners level of development (cognitive, affective and psychomotor))
- Content to be covered
- The time
- Learning material
- The environment
- Competencies to be developed

Teaching methods can be grouped under three main categories:
a)   **Cognitive development methods**

These are mainly:

- Discussion Method
- Socratic (Question and answer)
- Team Teaching Method
- Self-activity/independent learning
- Educational tours Method
- Group work
- Problem solving

b) Affective development methods

- Modelling Method
- Simulation Method
- Observation
- Exposition
- Lecture

c) Psychomotor development methods

- Inquiry
- Interactive e-learning
- Guided Discovery
- Demonstration and illustration Method
- Experimentation Method
- Programmed Learning Method
- Assignment Method
- Research
- Project Method
- Microteaching Method

TEACHING - LEARNING MATERIALS

These are materials which help the learner to learn effectively, faster, capture learners' interest and create virtual reality.

EXAMPLES

- ICT tools
- Geo-Board
- Environment
- Relevant texts
- Braille materials and equipment
- Talking books
- Charts
- Whiteboard or Chalkboard
- Videos

ASSESSMENT AND EVALUATION

Is the measure of success or failure in the teaching-learning process and provides feedback on the acquisition of knowledge and skills by learners as well as attitude.

EXAMPLES
- Tests and exercises
- Assignments
- Examinations
- Projects
- Presentations

CLASS MANAGEMENT

This is a process of planning, organising, leading, controlling classroom activities and maintaining discipline to facilitate an effective learning environment hence motivating learners.

Organisational skills for effective learning
This covers classroom organization from:
- Physical environment
- Classroom to be clean, tidy and airy
- Safety considerations when arranging furniture
- Teaching aids to be visible to learners.

- Emotional environment
- You need to be pleasant, firm but friendly.
- set the right tone
- tell learners what you expect from them.

- Grouping
- You may group your learners according to needs, abilities, and be gender sensitive.
- Encourage them to share ideas in groups.

- Class control and discipline
- be prepared for the lesson
- Be familiar with the schools policy on discipline.
- Be firm but fair
- Acknowledge good behaviour
- Punishments must be corrective and to the benefit of the child.
- create an atmosphere of trust and honesty

- Motivation
- Make your learners feel important through recognizing and rewarding achievements
- encouraging those who are lagging behind to continue working hard.
- Knowing learners by their names creates good rapport.
- Be a role model to your learners
.
- Supervision
- Always check learners' work in order to guide and correct them.
- Give immediate feedback in order to motivate learners.

UNIT 6

SCOPE OF THE GUIDE

TOPICS

The following topics are to be covered from form 5-6

- Introduction to Statistics
- Data Collection and Presentation of data
- Measures of Central Tendency
- Measures of Dispersion
- Sampling and estimation
- Probability
- Random Variables
- Errors
- Index Numbers
- Time Series
- Permutations and combinations
- Bivariate data
- Discrete random variables
- Continuous distributions
- Linear combinations of random variable
- Statistical inference
- Hypothesis testing

- Mean
- Mode and median

TEACHABLE UNIT: MEAN (hints)

NB . breakdown all the topics using the format above

TOPIC (Breakdown)

Form 3

MEASURES OF CENTRAL TENDENCIES

CONTENT	ACTIVITIES	METHODOLOGY	MATERIALS	EVALUATIONS
The mean • Definition • Advantages and disadvantages • computation	• Discussing the advantages and disadvantages of using the mean • Computing the mean	• Guided discovery • Problem solving • Experimentation • Demonstration and illustration • Research	• ICT tools • Whiteboard • Environment • Relevant texts • Braille material and equipment • Talking books	Should show strength and weaknesses of methodology,and whether objectives were achieved Map the way forward.

FORM 3	FORM 4	FORM 5	FORM 6
Introduction to Statistics			
Data Collection and Presentation	Data Collection and Presentation	Representation of Data	
Measures of Central Tendency	Measures of Central Tendency		
Measures of Dispersion	Measures of Dispersion		
Sampling	Sampling	Sampling and Estimation	Sampling and Estimation
Probability	Probability	Probability	Probability
Random Variables	Discrete Random Variables	Discrete Random Variables	Discrete Random Variables
Errors	Errors		
Index Numbers	Index Numbers		
Time Series Bivariate Data	Time Series Bivariate Data	Time Series	Bivariate Data
		Permutations and Combinations	
		Continuous Distributions	Continuous Distributions
			Linear Combinations of Random Variables
		Statistical Inference	Statistical Inference

CONCLUSION

This part on curriculum delivery assists you the teacher on expectations during lesson delivery eg classroom management and breaking down of topics. The guide might not have exhausted everything that is essential for curriculum delivery hence you are allowed to exploit more.

TOPICS FOR EACH LEVEL

TOPIC	FORM 3	FORM 4
Introduction to statistics	• Introduction to statistics • Importance of Statistics	
Data collection and Presentation	• Types of Data • Methods of collecting data • Methods of representing data	• Techniques of collecting data • Methods of representing data
Measures of central tendency	• Mean, mode and median of ungrouped data	• Mean, mode and median of grouped data
Measures of dispersion	• Range • Measures of relative position of ungrouped data • Variance and standard deviation	• Measures of relative position of grouped data • Variance and standard deviation
Sampling	• Sampling - key terms • Sampling techniques	• Sampling methods
Probability	• Probability – key terms • Experimental probability and theoretical probability • Single events -probability space -complementary events	• Combined events • Probability rules

Scope and Sequence (Form 3 and 4)

Random Variables	• Types of random variables • Properties of random variables	• Discrete random variables
Errors	• Estimation • Types of errors	• Computation of errors
Index numbers	• Types and uses of index numbers	• Price index and expenditure index • Demographic rates
Time Series	• Time series – key terms • Components of time series	• Time series graphs • Smoothening
Linear Regression	• Dependent and independent variables • Scatter diagram	• Line of best fit

Scope and Sequence (Form 5 and 6)

TOPIC	FORM 5	FORM 6
Representation of data	• Data collection • Data presentation • Measures of central tendency and dispersion (Grouped and ungrouped data)	-----------------
Permutations and combinations	• Permutations and combinations	-----------------
Probability	• Probability	• Probability
Discrete random variables	• Discrete random variables • Special discrete distributions	• Special discrete distributions
Continuous distributions	• Probability distribution of a continuous random variable • Normal distribution	• Exponential distribution
Linear combinations of random variables	-----------------	• Linear combinations of random variables
Sampling and estimation	• Sampling techniques and estimation	• Sampling and estimation
Statistical inference	• Hypothesis testing	• Hypothesis tests
Bivariate data	-----------------	• Linear regression and correlation
Time series	• Time series	-----------------