MINISTRY OF EDUCATION MALAYSIA

STATISTICAL DOMAIN IN THE MATHEMATICS CURRICULUM

CURRICULUM DEVELOPMENT DIVISION

Leading the Nation In Education

TASK 0: What are the main features of the school system & mathematics curriculum?

TASK 1: What are the reform issues of Statistics Curriculum?

TASK 2: Is Statistical Thinking specified? If yes, how?

TASK 3: What are the teaching materials (exemplars) used to teach statistical thinking?

TASK 4: What are the challenges for reform?

TASK 0

What are the main features of the school system
&
mathematics curriculum

EDUCATION IN MALAYSIA

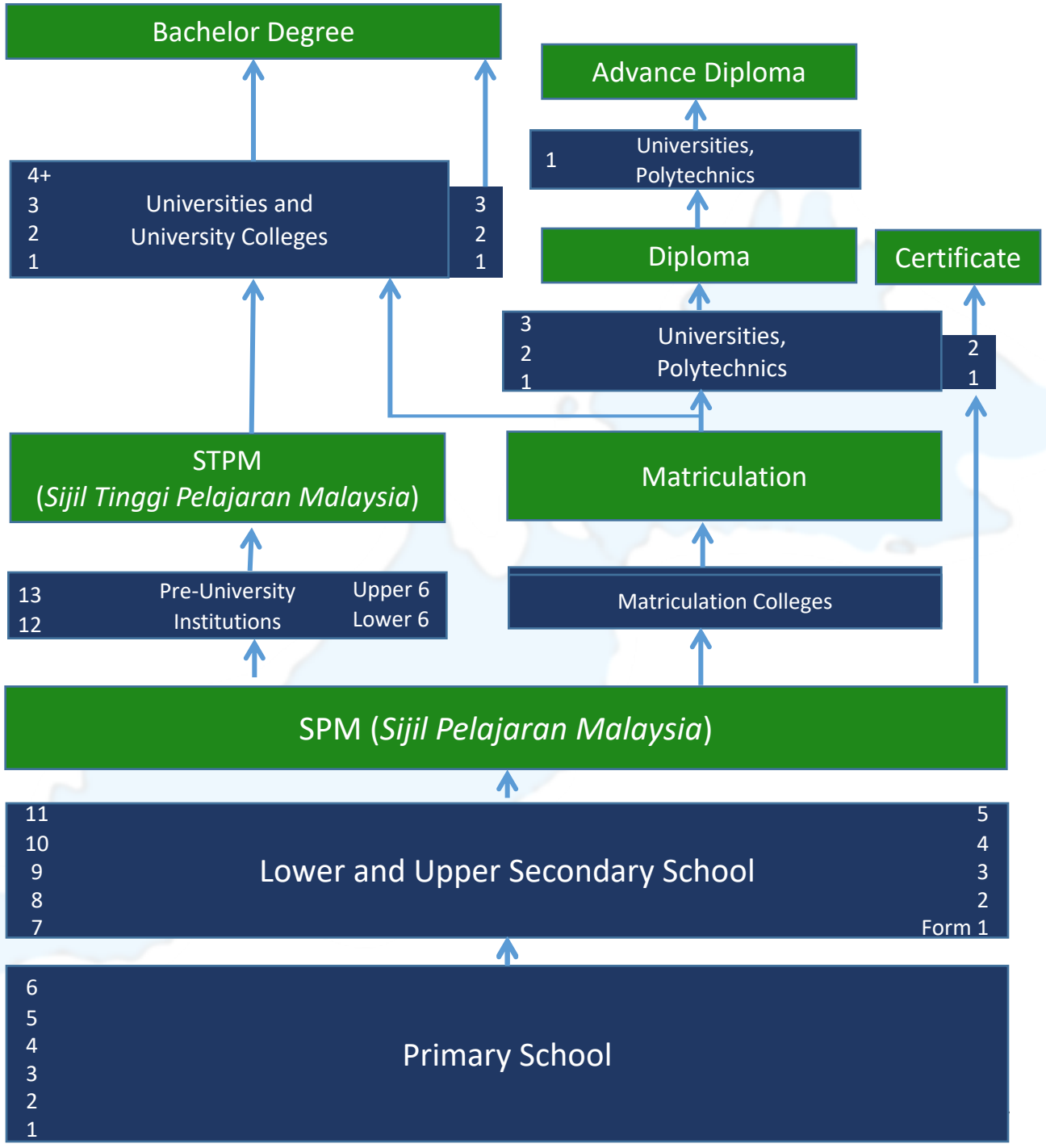
QUICK FACTS

Population
29,720,000
(2013, World Bank)

Compulsory Education
6 years

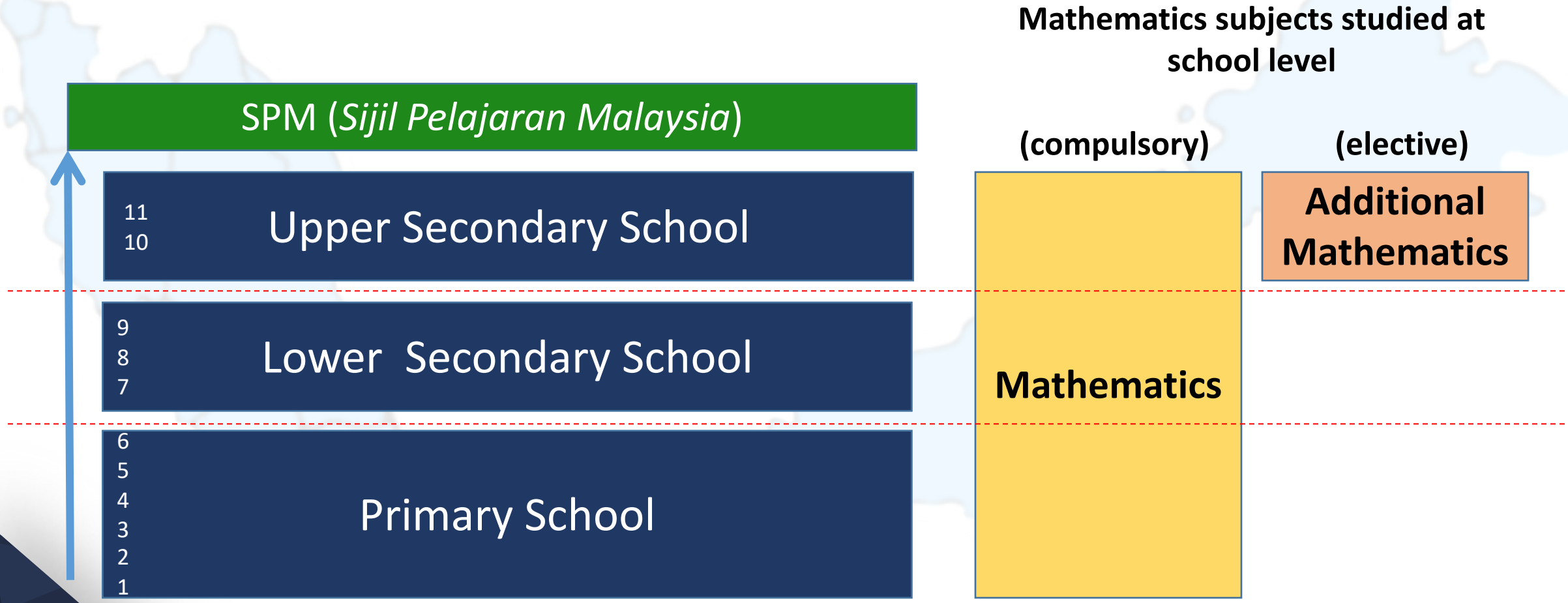
Language of Instruction
Bahasa Melayu, Chinese, Tamil, English

Academic Year
January - November



2019

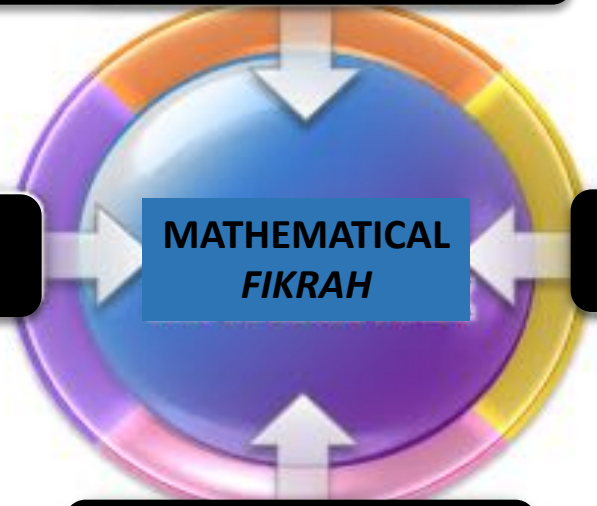
MATHEMATICS IN SCHOOLS



MATHEMATICS CURRICULUM FRAMEWORK

LEARNING AREA

- Number and Operation
- Measurement and Geometry
- Relationship and Algebra
- **Statistics** and Probability
- Discrete Mathematics



PROCESS

- Problem Solving
- Reasoning
- Communication
- Representation
- Connection

VALUES

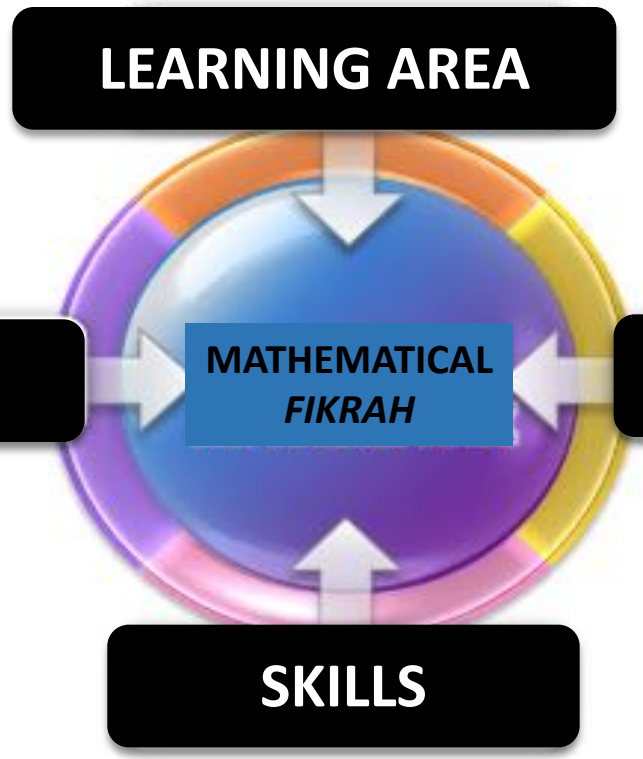
- Mathematical Values
- Universal Values

SKILLS

- Mathematical Skills
- 21st Century Skills
- Higher Order Thinking Skills

Mathematical *fikrah* - capable of doing mathematics, understanding mathematical ideas, and applying the knowledge and skills of mathematics responsibly in daily life, guided by good attitudes and values.

ADDITIONAL MATHEMATICS CURRICULUM FRAMEWORK



- Algebra
- Geometry
- Calculus
- Trigonometry
- **Statistics**

- Problem Solving
- Reasoning
- Communication
- Representation
- Connection

- Mathematical Values
- Universal Values

- Mathematical Skills
- 21st Century Skills
- Higher Order Thinking Skills

ORGANISATION OF STATISTICS DOMAIN

Preschool

(4+ - 5+ year olds)

Primary

(Year 1-6)
(6+ - 11+ year olds)

Lower Secondary

(Year 7-8)
(12+ - 14+ year olds)

Upper Secondary

(Year 9-10)
(15+ - 16+ year olds)

STATISTICS IN THE PRESCHOOL CURRICULUM (4+ - 5+ year olds)

- Introduction to ‘data sense’ – compare two groups of objects by stating many or few, equal or not equal and more or less
- Organize items into different categories and compare the results
- Use shapes like dots to represent number of objects

STATISTICS IN THE PRIMARY SCHOOL MATHEMATICS CURRICULUM (YEAR 1 TO 6)

Data Handling

- Collect, classify and arrange data.
- Recognise pictographs, bar charts and pie charts.
- Construct pictographs and bar charts.
- Interpret data from pictographs, bar charts and pie charts.
- Relating pictographs, bar charts and pie charts.
- Recognise and determine mode, median, mean and range.

STATISTICS IN THE LOWER SECONDARY SCHOOL MATHEMATICS CURRICULUM (YEAR 7 TO 9)

Data Handling

- Generate questions and collect relevant data.
- Classify data as categorical data or numerical data and construct frequency tables.
- Construct data representations for ungrouped data and justify the suitability of data representation.
- Convert one data representative to another appropriate representative and hence justify.
- Interpret multiple data representations including making inferences or predictions.
- Discuss the importance of representing data ethically

STATISTICS IN THE LOWER SECONDARY SCHOOL MATHEMATICS CURRICULUM (YEAR 7 TO 9)

Measure of Central Tendency

- Determine the mean, mode and median for a non-accumulated data set.
- Make conclusions on the effect of changing data set on the values of mode, mean and median.
- Collect data, construct and interpret frequency tables for grouped data.
- Determine the mode and mean classes for a set of grouped data.
- Select and justify the appropriate measure of central tendency to describe the distribution of a data set, including data sets that have extreme values.
- Determine the mode, mean, and median from the data representation.
- Apply an understanding of measure of central tendency to make predictions, forming convincing arguments and make conclusions.

STATISTICS IN THE UPPER SECONDARY SCHOOLS (YEAR 10 TO 11)

Measure of Dispersion

- Explain the meaning of the dispersion.
- Compare and interpret the dispersion of two or more data sets based on the stem-and-leaf and dot plot and thus make conclusion.
- Determine range, quartile ranges, variance and standard deviation as a measure to describe dispersion of ungroup data.
- Explains the advantages and disadvantages of various measures of dispersion to describe ungrouped data.
- Construct and interpret box plots for a set of ungrouped data
- Determines the effect of changes of data on the dispersion based on the value of measure of dispersion and graphical representation
- Compare and interpret two or more ungrouped data sets, based on the appropriate measure of dispersion and make conclusions.
- Solve problems involving measure of dispersion.

STATISTICS IN THE UPPER SECONDARY SCHOOLS (YEAR 10 TO 11)

- Solve problems involving measure of dispersion for grouped data.
- Design and conduct a mini-project involving statistical investigations based on the measure of central tendency and measure of dispersion and hence interpret and communicate findings.

Measure of Dispersion

- Construct histograms and frequency polygon
- Compare and interpret dispersions of two or more grouped data sets based on histograms and frequency polygons and thus make conclusions.
- Construct an ogive for a set of grouped data and hence determine quartiles.
- Determine range, quartile ranges, variances and standard deviations as a measure to describe dispersion of grouped data.
- Construct and interpret a box plot for a set grouped data.
- Compare and interpret two or more grouped data sets based on the appropriate measure of dispersion and make conclusions.

STATISTICS IN THE ADDITIONAL MATHEMATICS (YEAR 10 TO 11)

Form 5: Probability Distribution

- Describe the meaning of continuous random variable.
- Compare and contrast discrete random variable and continuous random variable.
- Describe the meaning of probability distributions of discrete random variables.
- Construct the table and draw a graph of discrete random variables.
- Describe the meaning of binomial distribution.
- Determine the probability of an event for the binomial distribution.
- Interpret information, construct the table and draw a graph of binomial distribution.

STATISTICS IN THE ADDITIONAL MATHEMATICS (YEAR 10 TO 11)

Form 5: Probability Distribution

- Determine and describe the value of the mean, variance and standard deviation for a binomial distribution.
- Solve problems involving binomial distributions.
- Investigate and describe the properties of normal distribution graph.
- Describe the meaning of standard normal distribution.
- Determine and interpret standardised variable, Z.
- Determine the probability of an event for normal distribution.
- Solve problems involving normal distributions.

TASK 1

What are the reform issues of the present Statistics Curriculum?

REFORM ISSUES

- Anxiety towards statistics amongst teachers
  - Rearrangement of content/introduction of new content
  - Lack of interest in subject matter- teaching stats as set of procedural knowledge and use of formulae
  - Pre-service teacher training do not emphasise enough on statistics discipline and statistical literacy.
- Probability and statistics perceived to be difficult for students.
- Statistics seen as component of mathematics rather than an application of mathematics in everyday life
- Assessment that do not provide information on student outcomes such as statistical reasoning and thinking.

TASK 2

Is Statistical Thinking specified in the curriculum? If yes, how?

STATISTICAL THINKING

Statistical Inquiry through Project-based and Problem-based learning

The Mathematics Curriculum across the levels emphasise statistical inquiry focussing on:

- Posing/Formulate real life problems, planning and collecting data
- Organization of data
- Representation of data
- Analysis of data
- Interpretation and making conclusions
- Communicate findings

STATISTICAL THINKING

Examples of Learning Standards

Form 2 (Year 8)

- Apply their understanding of measure of central tendency to make predictions, forming convincing arguments and making conclusions.

Form 5 (Year 11)

- Design and conduct a mini project involving statistical investigation based on measure of central tendency and measure of dispersion and hence interpret and communicate findings.



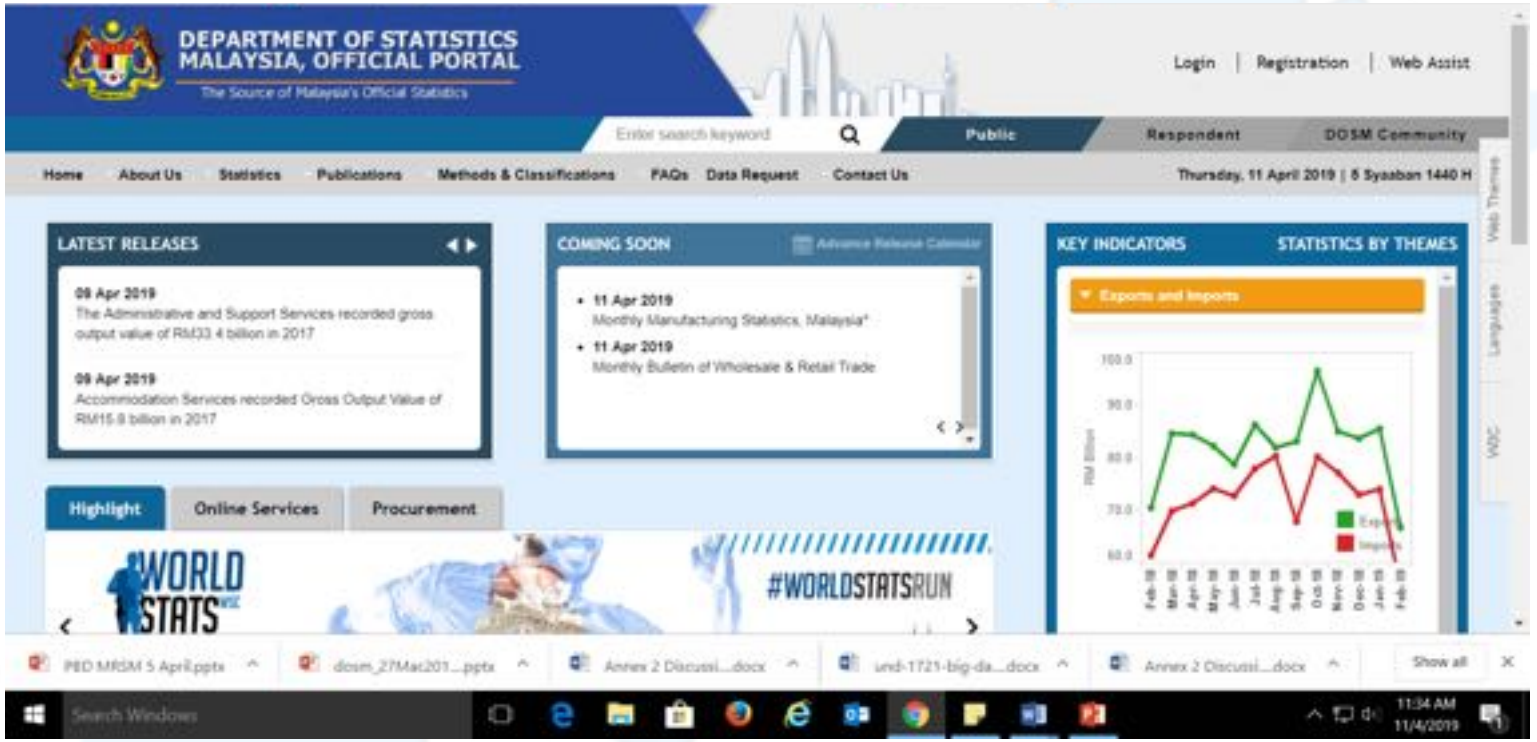

TASK 3

What are the teaching materials (exemplars) used to teach statistical thinking?

Modules to be used by the teachers in the teaching and learning of statistics **presently** being developed. Application of statistical **inquiry approach using of big data and AI.**

INVOLVEMENT OF DEPARTMENT OF STATISTICS MALAYSIA (DOSM)

MOE Malaysia has been working with The Department of Statistics Malaysia (DOSM) encouraging teachers to use the data collected by DOSM and conducting activities related to statistics.



TASK 4

What are the challenges for reform?

CHALLENGES FOR REFORM

Reform: Teaching the fundamentals of statistics while fostering statistical thinking for big data and the digital economy

Challenges:

- Changing mindsets of curriculum developers, teacher trainers and teachers
- Producing exemplars/ teaching and learning modules
- Teacher's competency – need for training on the new statistical thinking framework
- Allocation of time for statistical thinking activities in mathematics curriculum and school time table
- Accessibility to big data – Internet, computer availability in schools
- Financial implications

THANK YOU

TERIMA KASIH

MINISTRY OF EDUCATION MALAYSIA

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