Abstract

This comparative study analyzed probability and statistics in the 2013 Indonesian Curriculum, the 2013 Singapore Syllabus, and the 2010 Common Core State Standards for Mathematics. The study focused on the benefits and limitations related to the content and expectations of what students in grades 9-12 should learn, and the guidance provided to teachers for teaching the content. The purpose of this document analysis is to determine what different countries indicate as the most valuable content, skills, and strategies for teaching statistics and probability, and determining the best practices for teaching to achieve the content goals. To achieve this project goal, key questions were formulated that helped focus on comparing the documents from the three countries. Findings show that all three documents have the same vision, but differ in supporting students' level of understanding of statistics and probability content. It is hoped that the results will inform curriculum designers in Indonesia as they review and update the mathematics standards for the teaching of probability and statistics to their high school students.

Comparison of Content

- **Permutations and combinations**
  - Indonesia: 1.4
  - Singapore: 6.1
  - United States: CP1-9

- **Concepts of permutations & combinations**
  - Indonesia: 1.4
  - Singapore: CP1-9

- **Arrangement of objects**
  - Indonesia: 1.4
  - Singapore: CP1-9

- **Cases of repetition and restrictions**
  - Indonesia: 1.4
  - Singapore: CP1-9

**Probability**

- **Computing probability**
  - Indonesia: 1.6
  - Singapore: CP1-9

- **Exclusive and independent events**
  - Indonesia: 1.6
  - Singapore: CP1-9

- **Tables of outcomes, Venn diagrams & tree diagrams**
  - Indonesia: 1.6
  - Singapore: CP1-6

- **Conditions of probabilities**
  - Indonesia: 1.6
  - Singapore: CP6-9

**Binomial, Poisson, & normal distribution**

- **Concepts of binomial & Poisson distributions**
  - Indonesia: 7.1

- **Mean & variance of distributions**
  - Indonesia: 7.1

- **Problem solving involving distributions**
  - Indonesia: 7.1

- **Additive property of Poisson distribution**
  - Indonesia: 7.1

- **Concepts of normal distributions**
  - Indonesia: 1.3
  - Singapore: SM-D1-7

- **Finding P-value**
  - Indonesia: 7.2
  - Singapore: SM-D1-7

- **Using symmetry of normal distributions**
  - Indonesia: 1.3
  - Singapore: SM-D1-7

- **Relationships between mean, μ and δ**
  - Indonesia: 1.3
  - Singapore: SM-D1-7

- **Normal approximation to binomial & Poisson distributions**
  - Indonesia: 7.2

**Sampling**

- **Concepts of population and sample**
  - Indonesia: 1.5
  - Singapore: S-IC1-6

- **Random, stratified, systematic & quota samples**
  - Indonesia: 1.5
  - Singapore: S-IC1-6

- **Sampling methods**
  - Indonesia: 1.5
  - Singapore: S-IC1-6

- **Distribution of sample means from normal population**
  - Indonesia: 1.5
  - Singapore: S-IC1-6

- **Use of Central Limit Theorem**
  - Indonesia: 8.1
  - Singapore: S-IC5

- **Calculate unbiased estimate**
  - Indonesia: 8.1
  - Singapore: S-IC1-6

**Hypothesis Testing**

- **Concept of null & alternative hypothesis**
  - Indonesia: 8.2

- **Testing for population mean**
  - Indonesia: 8.2

- **Use of T-test**
  - Indonesia: 8.2

**Correlation and Regressions**

- **Presenting data using histograms, dot plots, box plots**
  - Indonesia: 1.1, 1.2
  - Singapore: S-ID6-9

- **Concepts of scatter diagram, correlation coefficient & linear regression**
  - Indonesia: 1.2
  - Singapore: S-ID6-9

- **Correlation coefficient of the equation of least square regression line**
  - Indonesia: 1.2
  - Singapore: S-ID6-9

- **Concepts of interpolation and extrapolations**
  - Indonesia: 1.2
  - Singapore: S-ID6-9

- **Use of square, reciprocal or logarithmic transformation to achieve linearity**
  - Indonesia: 9.1
  - Singapore: S-ID6-9

**Statistics**

- **Domain, Cluster, Standard**
  - Indonesia: 1.5, 1.2
  - Singapore: S-ID6-9

**Example of wording in Indonesia**

**Correlation and Regression**

1.2 Calculating coefficient of correlation and linear regression.

9.1 Correlation coefficient of the equation of least squares regression line.

**Singapore**

2.2 Calculating of product moment correlation coefficient and the equation of the least squares regression line.

**United States**

3.4 Interpretation and calculation of the correlation coefficient of a linear fit.

**Singapore Syllabus**

Indonesia Syllabus 2013.

Singapore Syllabus 2013.

Common Core State Standards 2010.


- **Standard (CCSSM)**
  - Indonesian Curriculum: Competency Standard, Basic Competency
  - Singapore Syllabus: Topic, Sub-Topic, Content
  - Common Core State Standard (CCSSM): Domain, Cluster, Standard

**Methods**

This comparative analysis was accomplished by:

- Translating the 2013 Indonesian documents in order to have an English version so others could understand the content.
- Constructing the key questions that would guide the examination of the documents and reduce informational bias.
- Reading thoroughly the documents focusing on the similarities and differences in the statistics and probability sections of each curriculum.
- Constructing a chart for determining the commonalities in the organization of each document and noting mathematical expectations.
- Identifying similarities and differences of the content of each document.
- Searching for evidence of teacher support in each document.
- Conducing an analysis of similarities and differences by subcategory in the major content areas.
- Gathering feedback from five mathematics teachers to do an expert evaluation which increases the reliability of the researcher’s findings.

**Conclusions**

- The three documents have the same vision but differ in supporting students' level of understanding probability and statistics content.
- Singapore syllabus treatment of statistics and probability includes a broad, advanced, and sophisticated levels of statistics and probability conceptual categories.
- The CCSSM has high expectations of learning statistic and probability, but gives options for teaching some of the more sophisticated concepts.
- The Indonesian Curriculum has the most limited presentation of required concepts for teaching statistics and probability and the most limited amount of support for teachers.

**Recommendations**

- The consistency of both the Singapore syllabus and the CCSSM should be adapted in order to guide both teachers and students.
- The Indonesian curriculum system could implement how CCSSM builds students' conceptual understanding of mathematical thinking.
- The Indonesian curriculum should look at how the Singapore Syllabus offers statistics and probability beginning at a young age, and continues building on the concepts through secondary school.
- The CCSSM should consider probability and statistics content for a wider variety of students, not just those who are college bound.

**References**