How well Indonesian schoolchildren proficiency in mathematics based on the result of national examination 2017

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Abstract. Public concern about how well Indonesian schoolchildren are learning Mathematics is abundant and growing. The globalization of markets, the spread of information technologies, and the premium being paid for workforce skills all emphasize the mounting need for proficiency in Mathematics. Media reports of inadequate teaching, poorly designed curricula, and low test scores fuel fears that young people are deficient in the mathematical skills demanded by society. This paper describes about Indonesian schoolchildren proficiency in Mathematics based on the result of National Examination 2017. The numerical computations talks that (1) the average math score nationally at any level is 46.38 - 57.94; (2) the mathematical proficiency of each district are very much different; (3) 46.8% - 53.3% district in Indonesia were below national average.

1. Introduction
We live in a time of extraordinary and accelerating change. New knowledge, tools, and ways of doing and communicating Mathematics continue to emerge and evolve. Quantitative information available to limited numbers of people a few years ago is now widely disseminated through popular media outlets. The need to understand and be able to use Mathematics in everyday life and in the workplace has never been greater and will continue to increase [1].

Public concern about how well schoolchildren are learning Mathematics is abundant and growing. The globalization of markets, the spread of information technologies, and the premium being paid for workforce skills all emphasize the mounting need for proficiency in Mathematics [2]. Media reports of inadequate teaching, poorly designed curricula, and low test scores fuel fears that young people are deficient in the mathematical skills demanded by society. Thus, what does it mean to be successful in Mathematics? Kilpatrick, dkk adopt a composite view of successful Mathematics learning. It recognised as understanding, computing, applying, reasoning, and engaging [3].

Hugh Burkhardt talks that the key principle of assessment is measure what is important, not just what is easy to measure [4]. National Examination is one of the interesting things in the system of assessment in Indonesia. It is a standard evaluation system of primary and secondary education in Indonesia and the equation of quality of education levels among the areas that are conducted by the Center for Educational Assessment, The Department of Education. Furthermore, POS UN 2015 emphasizes that the national examination becomes a tool to measure the competency and achievement of a graduate in a specific subject nationally, which refers to the standard of the graduate competency.
[5]. It was performed in all 34 provinces, 416 regency, and 98 city in Indonesia [6]. Almost all of the students in Indonesia following the test. It is very interesting.

In this study, we describe the results of national examination, in particular the national exam 2017. It will help us to observe how well Indonesian schoolchildren proficiency in Mathematics.

2. Experimental method
a) Take the published data on data.go.id [7].
b) Import the data into microsoft excell. Cleansing data and make descriptive analytic.
c) Compare the mean and standard deviation on each level.

3. Results and discussion
The use of statistical methods in manufacturing, development of food products, computer software, energy sources, pharmaceuticals, education and many other areas involves the gathering of information or scientific data [8]. Data have been collected, summarized, reported, and stored for perusal.

The descriptive statistics has been an important “toolbox” of statistical methods employed by statistical practitioners. It give a sense of center of the location of the data, variability in the data, and the general nature of the distribution of observations in the sample [9]. Measures of location are designed to provide the analyst with some quantitatitive values of where the center, or some other location, of data is located. One obvious and very useful measure is the sample mean. The mean is simply a numerical average [10]. The goal in measuring central tendency is to describe a distribution of scores by determining a single value that identifies the center of distribution. It is representative value for all of individuals in the distribution [11].

Just as there are many measures of central tendency or location, there are many measures of spread or variability. The sample measure of spread that is used most often is the sample standard deviation [12]. The concept of standard deviation is actually the probability interval evaluation value of an error (deviation) [13].

National examination held at 515 district in Indonesia. Mathematics is one of the subjects. It was always to be tested at every level. The result of the national exam 2017 published on data.go.id [7]. Thus, we make descriptive analytics based on the data. Table 1 shows the descriptive statistics on each district.

| Criteria | SMP | SMA IPA | SMA IPS | SMK |
|----------|-----|---------|---------|-----|
| Mean     | 57.94 | 54.60 | 53.77 | 46.38 |
| Range    | 52.34 | 63.35 | 67.42 | 66.00 |
| Min      | 34.43 | 19.87 | 19.3  | 21.54 |
| Max      | 86.77 | 83.22 | 86.72 | 87.54 |
| Variance | 141.06| 229.28| 236.87| 222.64|
| Std      | 11.88 | 15.14 | 15.39 | 14.92 |

Based on table 1, we have a value of mean, range, min, max, var, and standard deviation on each level education. Thus, based on that information, we try to make an analysis of the spread of the data. It will help us to observe how well Indonesian schoolchildren proficiency in Mathematics. Table 2 is the result of an analysis of the spread of the results of national examination in Indonesia.

| Criteria (score) | SMP (district) | SMA IPA (district) | SMA IPS (district) | SMK (district) |
|-----------------|---------------|-------------------|-------------------|---------------|
| < mean          | 49.5%         | 46.8%             | 49.2%             | 53.3%         |
3.1. Overview of Junior High School (SMP)
Based on table 1, the average score of Mathematics is 57.94. Based on the district, the maximum score is 86.77. The minimum score is 34.43. The range is 52.34. The standard deviation is 11.88. Based on the statistical description, the center of distribution in this exam is 57.94. It means that mathematical proficiency for Junior High School in Indonesia at level 57.94.

The probability interval evaluation value of error at level 11.88. Based on table 2, we know that 49.5% of districts in Indonesia were below average, 34.8% districts have score between mean and 70. Just 15.7% district have score more than 70. There are large differences between scores, then the variability is large.

Based on table 1 and table 2, we deduce that (1) the mathematical proficiency of each district are very much different; (2) 49.5% district in Indonesia were below national average.

3.2. Overview of Senior High School (SMA IPA)
Based on table 1, the average score of Mathematics is 54.60. Based on the district, the maximum score is 83.22. The minimum score is 19.87. The range is 63.35. The variance is 229.28. The standard deviation is 15.11. Based on the statistical description, the center of distribution in this exam is 54.60. It means that mathematical proficiency for “SMA IPA” in Indonesia at level 54.60.

The probability interval evaluation value of error at level 15.14. Based on table 2, we know that 46.8% of districts in Indonesia were below average, 35.8% districts have score between mean and 70. Just 17.4% district have score more than 70. There are large differences between scores, then the variability is large.

Based on table 1 and table 2, we deduce that (1) the mathematical proficiency of each district are very much different; (2) 46.8% district in Indonesia were below national average.

3.3. Overview of Senior High School (SMA IPS)
Based on table 1, the average score of Mathematics is 53.77. Based on the district, the maximum score is 86.72. The minimum score is 19.3. The range is 67.42. The variance is 236.87. The standard deviation is 15.39. Based on the statistical description, the center of distribution in this exam is 53.77. It means that mathematical proficiency for “SMA IPS” in Indonesia at level 53.77.

The probability interval evaluation value of error at level 15.39. Based on table 2, we know that 49.2% of districts in Indonesia were below average, 34.2% districts have score between mean and 70. Just 16.6% district have score more than 70. There are large differences between scores, then the variability is large.

Based on table 1 and table 2, we deduce that (1) the mathematical proficiency of each district are very much different; (2) 49.2% district in Indonesia were below national average.

3.4. Overview of Senior High School (SMA SMK)
Based on table 1, the average score of Mathematics is 46.38. Based on the district, the maximum score is 87.54. The minimum score is 21.54. The range is 66.00. The variance is 222.64. The standard deviation is 14.92. Based on the statistical description, the center of distribution in this exam is 46.38. It means that mathematical proficiency for “SMA SMK” in Indonesia at level 46.38.

The probability interval evaluation value of error at level 14.92. Based on table 2, we know that 53.3% of districts in Indonesia were below average, 38.7% districts have score between mean and 70. Just 8.0% district have score more than 70. There are large differences between scores, then the variability is large.

Based on table 1 and table 2, we deduce that (1) the mathematical proficiency of each district are very much different; (2) 53.3% district in Indonesia were below national average.
3.5. Comparison (SMP, SMA IPA, SMA IPS, SMK)
Based on table 1, the average score between SMP, SMA IPA, SMA IPS, and SMK almost the same. It is at the level of about 46-58 point. That means national average for Mathematics only 46-58 point. It is under 60 point. Then, we know that Junior High School has the highest average. It is 57.94. Senior High School has lower. In fact, for Vocational High Schools do not reach an average of 50. That means Vocational High Schools has the lowest score in Mathematics. The variance score between SMP, SMA IPA, SMA IPS, and SMK very large. It means that at every level mathematical proficiency of each district are very much different.

Based on table 2, we know that almost 50% of district in Indonesia were below average. It happens at every level. Just 8% - 16% districts have score more than 70 point. It talks to us that at every level almost 50% of district in Indonesia below the national average.

4. Conclusion
Based on the data, we deduce that, (1) the average math score nationally at any level is 46-58; (2) the mathematical proficiency of each district are very much different; (3) almost 50% district in Indonesia were below national average.

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