

Needs analysis and data analytics skills of PGSD Department Students Universitas Negeri Semarang

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Abstract. Data analytics skill in statistics is vital because it is immediately related to the accomplishment and writing of students' final projects. The objective of the preliminary study is to describe the data analytics skills of Primary School Teacher Education (PGSD) students and analyze students' needs in their attempts to accomplish and write the final project on time. This qualitative study was conducted at the Department of Primary School Teacher Education, Faculty of Educational Universitas Negeri Semarang, involving students in the sixth semester as the research subject. The techniques of data analysis were the interactive model by Miles and Huberman and Rasch model. The results of this study showed that students in the sixth semester needed innovation in the learning sources for educational statistics course by 95.15%. Data analytics skills of students achieved the average logit model by 0.37. The conclusion of the preliminary study is the majority of students in the sixth semester need innovation in learning sources for educational statistics course and students' skills in analyzing data which are categorized high are only 8%.

1. Introduction

The awareness-raising on the importance of data usage can improve education quality. Although the focus of this issue is in the data usage to enhance the quality of higher education, the initial step is producing the graduates that are critical on the data and can work analytically

Furthermore, data analytics skill in statistics is becoming important because it is immediately related to the accomplishment and writing of students' final project. In the Department of Primary School Teacher Education, there is Educational Statistics course with 3 credit system units taught in the sixth semester. In addition statistics become important because by mastering the knowledge of statistics, one can master various statistical information in daily life [1].

Some of the mistakes that students show in statistical courses were when conducting a test pre-condition, when using the formula, when calculating and when testing the hypothesis by comparing calculation results with tables [2]. The previous study discussing this course concluded that mind mapping helps students understand the way of thinking of the data analytics process, and using SPSS software helps students who face difficulties in applying a formula or statistics test in analyzing the data [3]. The difficulties in applying statistical procedures [4] also occur in students of the Department of Primary School Teacher Education, particularly in processing the data using inferential statistics. The results [4] created a method that is easily used to analyze data, particularly in the experimental design with SPSS. SPSS is a software commonly used in data processing besides Excel. The use of



software in the statistics course needs to correspond to constructive learning, where the statistical concepts can be well accepted by students [5]

The skill in analyzing data is closely related to statistical data analysis. According to [6] data analysis is the use of data broadly and systematically, including quantitative, explorative, and predictive data analysis to make a decision and a business action. Therefore, students need to have the skills, not only as a requirement to accomplish a final project but also a requirement in the world of work.

The problems of this study are:

- 1) How is the result of students' needs analysis in the Department of Primary School Teacher Education, Faculty of Education Universitas Negeri Semarang on the learning materials of Educational Statistics?
- 2) How is the initial students' skill of the Department of Primary School Teacher Education in analyzing data?

2. Methods

The research steps were analyzing the students' needs of learning materials of Educational Statistics with the help of technology and measuring the initial skills of students in analyzing data. In the analysis step, the researcher conducted a needs analysis of learning materials of Educational Statistics with the support of mind map and communication and information technology by distributing questionnaires of needs analysis to 56 students in the sixth semester. From the result, it obtained important things for the next process, which was designing and developing learning materials.

Furthermore, there was a mapping of students' initial skills in analyzing data using a diagnostic test to 25 students. From the diagnostic test, it obtained specific materials to measure the data analytics skills of students in the Department of Primary School Teacher Education.

The results of needs analysis belonged to qualitative data, and the results were analyzed using interactive data analysis technique including data collection, data reduction, data display and conclusions [7]. Meanwhile, the results of the diagnostic test were analyzed using the Rasch model [8] to obtain a description of students' initial skills and determine the materials which needed to be discussed further in the Educational Statistics course.

3. Results and Discussion

3.1. Students' needs analysis of learning materials for educational statistics

Questionnaires of needs analysis which were distributed to 56 students in the Department of Primary School Teacher Education, and it can be concluded that 95.17% of the students realized the importance of innovation in the textbook of Educational Statistics by considering several points (1) the completeness of formulas and the examples of use, (2) the examples of topic in educational research in primary schools, (3) the steps of data processing using technology (Excel, SPSS), (4) equipped with a mind map to understand the mindset of data analysis.

The completeness of formulas and the examples of use in statistics are important things after students understand the concept of data processing in statistics. Meanwhile, the examples of topics in educational research are needed as the learning materials in the Educational Statistics course. The two things are the improvement of the reference book widely used by students in the Department of Primary School Teacher Education, where there was a misprint in the formulas, and the examples were not suitable for the education field.

The use of technology as a tool is expected to help students to get faster in data processing, although it is for a huge number of data. However, the results of the study by [5] showed that the use of technology familiarized students with the practical aspect of statistics, but not contributing to the improvement of students' understanding of the important concept in statistics. Furthermore a software application with a graphical user interface is useful to make it easier to display, visualize, and analyze table data stored in databases and data files[9].

Therefore, from the result of the needs analysis, there were students' needs for the way of thinking to help their understanding. This way of thinking can be realized in a mind map. A mind map features a radial structure, i.e. the contents of the reorganized text by placing a central theme in the center of the page, where some related ideas spread in the form of colourful branches[10]. Fortunately a mind map helps students learn information by organizing the information and adding pictures as well as coloring them [11]. Another important reason that the use of mind map in the lecture is in line with the study by [12], stating that mind map can organize and shape information in a great amount, mind map is a visual media that enables information to be processed, understood, and remembered based on the students' learning style.

3.2. Students' initial skills in analyzing data

The diagnostic test was given in the form of 7 essay items with the guidelines and material description are (1) determine the type of data based on the scale, (2) analyse the sampling technique of the correlation cases, (3) determine the data proportion which is normally distributed using the formula of normal distribution, (4) explain the differences of validity and reliability of research instrument, (5) predict the dependent variable value based on the value of independent variable in regression equation, (6) analyze the output of SPSS for the multiple linear regression, (7) evaluate various problems in conducting research using data analysis with inferential statistics. This diagnostic test to measure data analysis capabilities referring to scientific processes that examine data to formulate conclusions and to make decisions[13]. According to[14], data analysis competence is influenced by several things, namely data quality, large data, analyzing skills, key knowledge, and sophistication of tools or software used.

The test was given to 25 students in the sixth semester of the Department of Primary School Teacher Education, Faculty of Education Universitas Negeri Semarang. The result of the diagnostic test was analyzed using Rasch model and obtained some points as follows:

- 1) The average score of person logit was 0.37 (table 1) more than 0.0 logit, meaning that there was a tendency of the respondents to answer the instrument or diagnostic test. It means that all questions could be answered by students. However, the score of person separation was 0.0, meaning that students' initial skills in doing diagnostic test could not be categorized.

Table 1. The Summary of 25 Measured Person

	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	ZSTD	OUTFIT MNSQ	ZSTD
MEAN	20.1	7.0	0.37	0.39	1.01	0.04	0.96	0.30
SEM	0.4	0.0	0.07	0.00	0.09	0.19	0.12	0.15
P.SD	2.2	0.0	0.33	0.02	0.46	0.94	0.58	0.76
S.SD	2.2	0.0	0.33	0.02	0.47	0.95	0.60	0.77
MAX.	24.0	7.0	1.03	0.47	2.11	1.85	2.30	1.40
MIN.	15.0	7.0	-0.37	0.37	0.32	-2.02	0.30	-1.36
REAL MODEL S.E.	RMSE .43 RMSE .40 OF Person MEAN=	TRUE SD .00 TRUE SD .00 .07	SEPARATION .00 SEPARATION .00		Person RELIABILITY .00 Person RELIABILITY .00			

- 2) The item reliability score was 0.88 (good category) (table 2), however, the person reliability score was 0.00 (bad category). It means that the consistency of the respondents' answer was bad, but the instrument item quality was good. From Table 4, it obtained the separation item score 2.76, so that the diagnostic test item can be categorized with the following formula 1.

$$H = \{(4 \times \text{separation}) + 1\} : 3 = \{(4 \times 2.76) + 1\} : 3 = 4.01 \quad (1)$$

The calculation result 4.01 was rounded down to 4, therefore, there were 4 categories of the diagnostic test item.

Table 2. Summary of 7 Measured Item

	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	ZSTD	OUTFIT MNSQ	ZSTD
MEAN	71.9	25.0	0.00	0.23	0.92	0.00	0.96	0.15
SEM	7.0	0.0	0.29	0.03	0.12	0.49	0.12	0.47
P.SD	17.2	0.0	0.70	0.06	0.30	1.20	0.30	1.15
S.SD	18.6	0.0	0.76	0.07	0.33	1.30	0.33	1.24
MAX.	94.0	25.0	1.22	0.36	1.51	2.52	1.56	2.57
MIN.	39.0	25.0	-1.12	0.17	0.55	-1.42	0.67	-1.17
REAL RMSE	.24	TRUE SD .66	SEPARATION	2.76	Person RELIABILITY	.88		
MODEL RMSE	.23	TRUE SD .66	SEPARATION	2.84	Person RELIABILITY	.89		
S.E.	OF Person MEAN= .07							

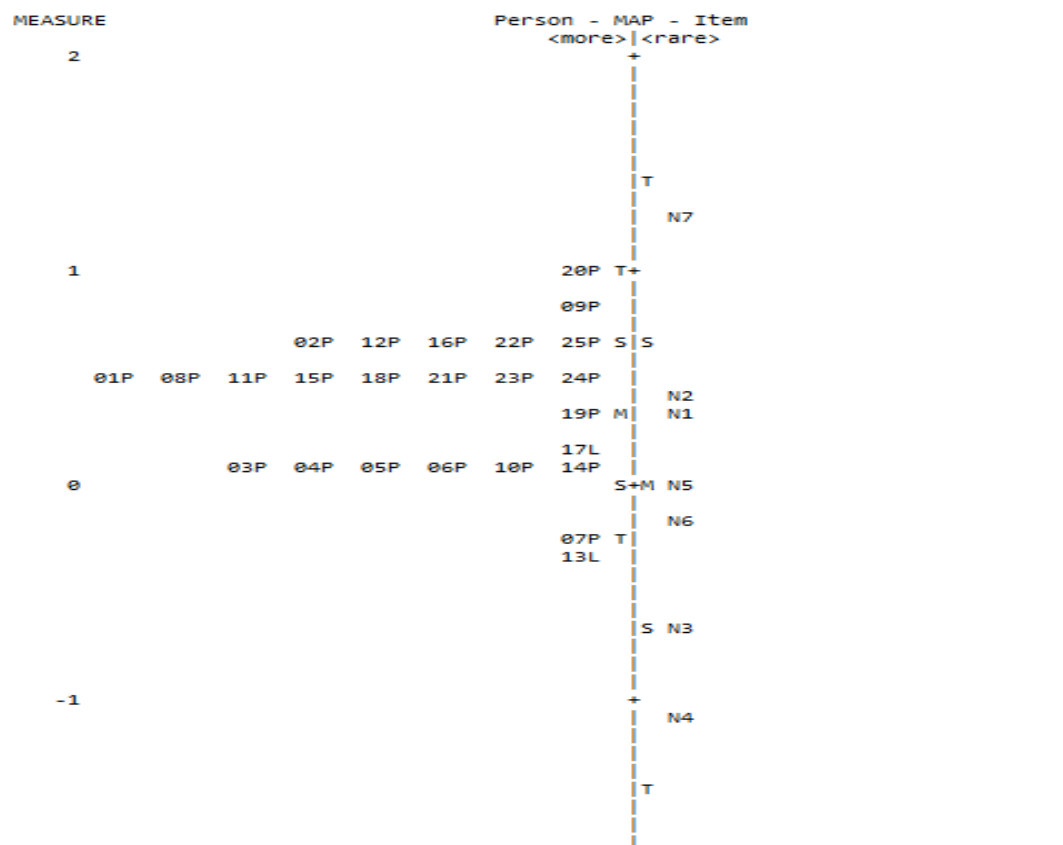


Figure 1. Wright Map

- 3) Figure 1 of Wright Map presented information that the average score of item logit was 0.0. Therefore, the most difficult questions according to the respondents were numbers 7, 2, and 1, and the easiest number in order was numbers 4, 3, and 6. In the Wright Map (figure 1), it obtained the information that students whose initial skills in analyzing data were above the average score of person logit (more than 0.37) included 15 students out of 25 students doing the diagnostic test.

- 4) Based on Table 1, it obtained the average logit score of 0.37 and the standard deviation of the logit 0.33 (in the measure column). From this information, students' initial skills can be categorized into high, medium, and low. The result of the categorization was presented in Table 3.

Table 3. The Categorization of Students' Initial Skills

Logit Score Limit	Category	Total	Percentage
More than 0.67	High	2	8%
0.37 – 0.67	Medium	13	52%
Less than 0.37	Low	10	40%

The analysis result using the Rasch model showed that there was only 8% of the students with high initial skills. Meanwhile, out of 7 test items in the diagnostic test, the most difficult item was N7 with the indicator "evaluate various problems in conducting research using data analysis with inferential statistics". Analytical is the highest level of the four levels in statistical reasoning where students can make links between relevant parts of domain [15].

This is in line with the study by [16] mentioned that analytical thinking skills and problem-solving skills need to be emphasized in the learning. Moreover, the two skills are important in various fields [17]. The two skills, therefore, are becoming a concern in developing learning materials for Educational Statistics.

4. Conclusion

Based on the result of data analysis and discussion, the conclusions of this study are: The results of needs analysis of learning materials for Educational Statistics show that (a) a complete structure of learning materials, formulas, and the example of formulas, (b) learning materials are equipped with the examples of topic in educational research, (c) data processing with the help of technology using Excel and SPSS software, (d) mind map as a guideline of way of thinking in the process of data analysis. Students' initial skills in analyzing data show that only 8% of the students belong to the high category, and the rest is in the medium and low categories.

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