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Analyzing students' statistical literacy skills based on gender, grade, and educational field

Riwayani[1], Edi Istiyono[2], Supahar[2], Riki Perdana[2], Soeharto[3]
[1]Department of Science Education, Faculty of Science and Mathematics, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia
[2]Department of Physics Education, Faculty of Science and Mathematics, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia
[3]Graduate School Program, Faculty of Humanities and Social Sciences University of Szeged, Szeged, Hungary

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ABSTRACT

Statistical literacy is fundamental competence to think critically and to conclude information based on data. This study aims to describe students' statistical literacy according to gender, grade, and educational field. This research was a quantitative method with a cross-sectional design by explaining and analyzing the results using Rasch modeling, and students' statistical literacy was categorized and described according to statistical literacy topics, gender, student grade level, and educational field. The respondent of this study was 271 students obtained through the stratified random sampling in Yogyakarta's senior high school. The result of this study confirmed that the statistical literacy skills of students are still at a low level. The lowest aspect is the scope of conclusions, while the highest aspect is data production (medium level). There are no significant differences in statistical literacy skills based on gender and class. However, there are significant differences in statistical literacy based on field education. It indicates that policymakers or teachers should improve students' statistical literacy skills by training or applying a learning model that focuses explicitly on statistical literacy skills.

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Corresponding Author:

Riwayani
Department of Science Education, Faculty of Science and Mathematics, Universitas Negeri Yogyakarta
Caturtunggal, Depok, Sleman, Yogyakarta, Indonesia
Email: riwayani.2022@student.uny.ac.id

1. INTRODUCTION

Statistical literacy is essential for expert exercise. However, even though those competencies are fostered during the studying process, there are signs that they may be underdeveloped for students [1]. Statistical literature is a complex construct that requires not only a range of basic skills (reading, comprehension, and communication) but also higher-order cognitive skills of interpretation, prediction, and critical thinking so these skills must be taught if students want to become good citizens [2]. So, this skill is very important, where the importance of skill is emphasized in many curriculum documents, and concepts related to statistics and probability are incorporated into various curricula [3].

Statistical literacy is complex, encompassing not only statistical content and technical procedures but also the basic skills that can be used to understand statistical information and research results [4]. Statistical literacy is the ability to fully understand statistics, handle the daily flood of information, think critically about it, and make sound decisions based on that information. Statistical literacy is the cap potential to grasp statistical concepts, calculations, applications, and interpretations [5]. To pave the way for successfully incorporating statistical competence into education, it is necessary to present concrete concepts that make statistical teaching competence attractive to students and teachers [6].

Statistical literacy is not only the ability to read statistical information but to be able to see information that is not reported and what underlies that information. Currently, in secondary schools, statistical competence is part of mathematics competence [7]. Even though statistical literacy also needs to be developed in other subject competencies because students are in a data-based technology society [8]. In addition, statistical literacy skills are useful for research purposes in both the social and scientific fields such as collecting and using data [9], communicating data, using statistic technology to interpret and present data [10].

Statistical literacy of students is very important to develop arguments derived from data-based decisions [11]. This can be done by creating didactic designs and materials that focus on developing statistical literacy using digital tools [12]. The design principles are resolving conflicting information, reading incomplete information, the issues presented are critical and using digital tools to describe the data. Aspects of statistical literacy developed are problem understanding, data processing and data interpretation [13]. There are four main factors that influence the development of students' statistical literacy: learning environment, teaching methods, student attitudes, and student basic knowledge [11].

Studies examining the effect of gender on statistical literacy are relatively rare [14]. Previous study [15] found that both male and female participants' statistical literacy levels were still low even though they were postgraduate students. In addition, there was no statistically significant difference in literacy skills by gender [16]. Therefore, research on statistical literacy based on gender still needs to be done. This aims to prove in more detail whether there are differences in students' abilities by gender. In addition, studies also need to be carried out on differences in statistical literacy skills based on class level and field of education. When it is known in detail, policymakers can choose the right method in the learning process.

Statistical literacy is needed in every area of life. It holds a central position in every field, such as commerce, psychology, science, astronomy, and medicine, where statistics are widely used in everything from news reports, sports, weather, elections, and economics [17]. This condition demands that all lines in various fields of knowledge must have good statistical literacy skills. However, there has not been much research on literacy based on differences in education. Therefore, this study aims to analyze students' statistical literacy skills based on their gender, class, and field of education.

2. RESEARCH METHOD

This study aimed to describe students' statistical literacy skills based on gender, grade, and educational field using a cross-sectional design. There were 95 students from class X (first year) and 176 from class XI (second year) using stratified random sampling selected from public senior high schools in Yogyakarta, whereby the population in the whole province is around five million students. There were 101 male students and 170 female students who participated in this study. They come from two different programs, namely 131 students from science class and 140 students from social class. The items of statistical literacy were adopted from Ziegler and Garfield [18]. There are 37 items of students' statistical literacy skills, and it is divided into nine topics: 8 items for data production, 3 items for graphs, 5 items for descriptive statistics, 3 items for empirical sampling distribution, 3 items for confidence intervals, 3 items for randomization distributions, 8 items for hypothesis tests, 2 items for the scope of conclusions, and 2 items for regression and correlation. Each item consists of multiple-choice questions. All participants were asked to fill out the test was distributed.

Data analysis was performed using the quantitative method. In this study, Rasch modeling analysis was used to conduct an empirical test of the current item. The Rasch model has several advantages such as estimated values are on the same scale of latent units (logits) for person and items [19], more accuracy of calculation by calibrating simultaneously in three ways namely measurement scale, person and item [20], and predict missing data with systematic response patterns [21]. Students' statistical literacy skills were described in several aspects, including statistical literacy, gender, grade, and educational field. Table 1 shows the level of students' statistical literacy skills according to Valdez and Bungihan [22]. Rasch analysis was utilized using Winsteps version 3.73 software. Rasch analysis included item measure, person fit order, summary statistic, and scaling using a Wright map. The statistical package for the social sciences (SPSS) analysis was used to show the relationship between gender, grade, and educational field on statistical literacy skills.

Table 1. Level of students' statistical literacy

Range	Level
0.00–0.49	Very low
0.50–1.49	Low
1.50–2.49	Medium
2.50–3.49	High
3.50–4.00	very high

3. RESULTS AND DISCUSSION

This section explained the results of students' statistical literacy skills based on gender, grade, and educational field. Evaluation of persons and items using the same criteria based on [23]. Table 2 shows the outfit mean-square (MNSQ) for item and person was acceptable (0.5<MNSQ<1.5), and outfit z-standardized (ZSTD) for item and person was also acceptable (-2.00<ZSTD<+2.00). The person reliability value shows that the consistency of student answers is weak, but the item reliability value shows that the quality of the items is very good. The Cronbach's Alpha value shows an excellent value (0.99) for overall interaction between person and items. In addition, the value of the separation item >5 indicates that the items used can classify students' abilities very well [24].

Table 2. Summary of Rasch measurement

SL test	Measure	Mean Outfit MNSQ	Outfit ZSTD	Std. deviation	Std. error	Separation	Reliability	Cronbach's alpha
Persons (N=271)	-0.67	1.02	0.00	0.57	0.12	1.08	0.54	0.99
Item (N=37)	0.00	1.02	0.00	0.83	0.02	5.67	0.97	

To confirm validity criteria based on item, the item measure based on Rasch parameter are presented in Table 3. The item measures range from -1.74 to 1.74, and the outfit MNSQ values range from 0.9 to 1.33 confirming all items achieving fit validity criteria based on Rasch model. In addition, all items have positive values of point measure correlation (PTMA) explaining all item measure same construct in one direction. Therefore, we can confirm the instrument used in this study have acceptable fit validity criteria in instrument and item level.

Table 3. Item measure and fit criteria

No.	Topic	Item code	Measure (logits)	Outfit MNSQ	PTMA	No.	Topic	Item code	Measure (logits)	Outfit MNSQ	PTMA
1.	Data production	S1	-1.37	0.90	0.36	5.	Confidence	S20	-0.95	1.08	0.18
		S2	-0.56	1.04	0.17		intervals	S21	0.64	1.04	1.04
		S3	-0.07	0.91	0.38			S22	-0.49	1.05	0.17
		S4	-1.60	0.95	0.29	6.	Randomization	S23	1.01	1.15	0.08
		S5	-1.16	0.94	0.33		distributions	S24	0.39	1.06	0.16
		S6	1.74	1.33	0.01			S25	-1.16	0.98	0.29
		S7	0.83	1.20	0.07	7.	Hypothesis tests	S26	0.51	0.95	0.26
		S8	-1.46	0.90	0.36			S27	0.20	1.13	0.09
2.	Graphs	S9	-0.94	0.96	0.32			S28	-0.70	1.00	0.38
		S10	0.98	0.97	0.23			S29	0.21	1.16	0.07
		S11	-0.65	1.03	0.20			S30	-0.10	0.94	0.32
3.	Descriptive statistics	S12	-0.05	0.98	0.27			S31	0.57	1.05	0.22
		S13	-0.68	0.99	0.26			S32	0.37	1.08	0.13
		S14	-0.41	0.95	0.32			S33	0.95	1.20	0.09
		S15	-0.09	0.95	0.31	8.	Scope of	S34	0.00	1.03	0.20
		S16	-1.74	1.15	0.11		conclusions	S35	0.71	1.01	0.21
4.	Empirical sampling	S17	-0.02	1.01	0.22	9.	Regression and	S36	-0.89	0.96	0.32
	distributions	S18	-0.03	0.98	0.26		correlation	S37	0.18	0.90	0.37
		S19	0.47	0.98	0.25						

Figure 1 shows the results of Wright's map using Rasch modeling. Analysis based on the Wright map provides invaluable information about item difficulty and student abilities. Generally, we can confirm that all items can cover all student abilities. Item S16 and S6 (+1.70 logit) indicated the item with the highest difficulty level. Item S4 (-1.60 logit) indicated the item with the lowest difficulty level. Furthermore, the average logit person (M) was -0.70 logit, which was below the average logit item (M+) of 0.00 logit. This finding implied that the student's ability is below the item difficulty standard.

3.1. Students' statistical literacy based on the indicators

In this section, the students' statistical literacy skills were described according to indicator and topic. Figure 2 shows the result of students' statistical literacy for the test. The analysis based on the topic of data production shows that the highest mean is item 4 (2.82) and the lowest mean is item 6 (0.37). On the topic of graphs, the highest mean is item 11 (1.98) and the lowest mean is item 10 (0.69). On the topic of descriptive statistics, the highest mean is item 13 (2.01) and the lowest mean is item 16 (0.37). On the topic of empirical

sampling distributions, the highest mean is item 18 (1.42) and the lowest mean is item 19 (1.02). On the topic of confidence intervals, the highest mean is item 22 (1.83) and the lowest mean is item 20 (0.71). On the topic of randomization distributions, the highest mean is item 25 (2.45) and the lowest mean is item 23 (0.68). On the topic of hypothesis tests, the highest mean is item 28 (2.02) and the lowest mean is item 33 (0.71). On the topic of scope of conclusions, the highest mean is item 34 (1.39) and the lowest is item 35 (0.86). On the topic of regression and correlation, the highest mean is item 36 (2.20). While the lowest mean is item 37 (1.24). This finding indicated that students are still having difficulty with indicator "Ability to determine if a variable is an explanatory variable or a response variable".

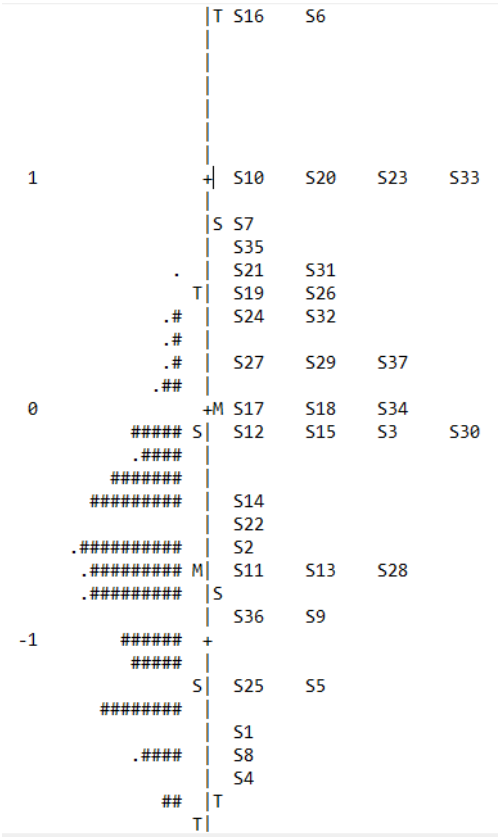

Figure 1. The result of wright map

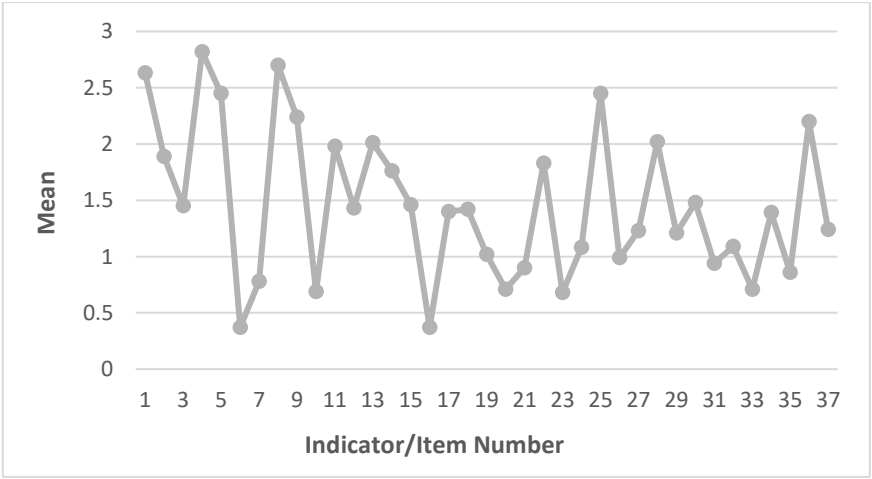

Figure 2. Student statistical literacy skill based on topic and indicator

Table 4 shows that the highest mean average was the topic of data production, and the lowest mean average was the topic of the scope of conclusions. These findings indicated that students have difficulty on the topic of the scope of conclusions. Overall, the students' statistical literacy skills were a medium category on the topic of data production, graphs, and regression correlation. These findings indicated that students' statistical literacy skills still need to be improved on the topic of descriptive statistics, empirical sampling distributions, confidence intervals, randomization distributions, randomization distributions, and the scope of conclusions.

Table 4. The result of students' statistical literacy skills based on topic and indicator

Topic	Mean average	Description
Data production	1.89	Medium
Graphs	1.64	Medium
Descriptive statistics	1.41	Low
Empirical sampling distributions	1.28	Low
Confidence intervals	1.15	Low
Randomization distributions	1.40	Low
Hypothesis tests	1.21	Low
Scope of conclusions	1.12	Low
Regression and correlation	1.72	Medium

3.2. Students' statistical literacy skills based on gender

In this section, the result of students' statistical literacy skills was described according to gender. Based on the topic of data production, the highest mean for male and female is item 4 with a score 2.69 (high) and 2.89 (high) while the lowest mean is item 6 with a score 0.32 (very low) and 0.40 (very low). On the topic of graphs, the highest mean for male and female is item 9 with a score 2.57 (high) and 2.05 (medium) while the lowest mean is item 10 with a score 0.75 (low) and 0.66 (low). On the topic of descriptive statistics, the highest mean for male and female is item 13 with a score 2.10 (medium) and 1.95 (medium) while the lowest mean is item 16 with a score 0.44 (very low) and 0.33 (very low). On the topic of empirical sampling distributions, the highest mean for male is item 18 with a score 1.50 (medium) while the lowest mean is item 17 with a score 1.35 (low). Meanwhile, the highest mean for female is item 17 with a score 1.44 (low), while the lowest mean is item 19 with a score 0.78 (low). On the topic of confidence intervals, the highest mean for male and female is item 22 with a score 1.74 (medium) and 1.88 (medium) while the lowest mean is item 20 with a score 0.48 (very low) and 0.85 (low). On the topic of randomization distributions, the highest mean for male and female is item 25 with a score 2.46 (medium) and 2.45 (medium) while the lowest mean is item 23 with a score 0.59 (low) and 0.73 (low). On the topic of hypothesis tests, the highest mean for male and female is item 28 with a score 1.90 (medium) and 2.09 (medium) while the lowest mean is item 33 with a score 0.48 (very low) and 0.85 (low). On the topic of scope of conclusions, the highest mean for male and female is item 34 with a score 1.43 (low) and 1.36 (low) while the lowest mean is item 35 with a score 0.67 (low) and 0.96 (low). On the topic of Regression and correlation, the highest mean for male and female is item 36 with a score 2.18 (medium) and 2.21 (medium) while the lowest mean is item 37 with a score 1.27 (low) and 1.22 (low). These finding indicated that male students are still having difficulty with indicator "Ability to determine if a variable is an explanatory variable or a response variable." While female students are still having difficulty in with indicator "Understanding the properties of standard deviation."

Table 5 shows that the highest mean average for males and females is topic of data production while the lowest mean average was topic of scope of conclusions. This finding indicated that both male and female students' statistical literacy skills still need to be improved on the topic of scope of conclusions. Table 6 shows that there is no significant difference by gender with sig. > 0.05 on the students' statistical literacy.

Table 5. The result of students' statistical literacy skills based on gender

Topic	Male		Female	
	Mean average	Description	Mean average	Description
Data production	1.85	Medium	1.91	Medium
Graphs	1.83	Medium	1.52	Medium
Descriptive statistics	1.39	Low	1.42	Low
Empirical sampling distributions	1.43	Low	1.19	Low
Confidence intervals	1.00	Low	1.23	Low
Randomization distributions	1.40	Low	1.40	Low
Hypothesis tests	1.19	Low	1.22	Low
Scope of conclusions	1.05	Low	1.16	Low
Regression and correlation	1.72	Medium	1.72	Medium

Table 6. Multivariate based on gender

	Effect	Value	F	Sig.
Gender	Pillai's Trace	.049	1.482[a]	.154
	Wilks' Lambda	.951	1.482[a]	.154
	Hotelling's Trace	.051	1.482[a]	.154
	Roy's Largest Root	.051	1.482[a]	.154

3.3. Students' statistical literacy skills based on grade

In this section, the result of students' statistical literacy skills was described according to grade or class. Based on the topic of data production, the highest mean for grade X and XI is item 4 with a score 2.69 (high) and 2.89 (high) while the lowest mean for grade X is item 7 with a score 0.46 (very low) and for grade XI is item 6 with a score 0.30 (very low). On the topic of graphs, the highest mean for grade X is item 11 with a score 2.36 (medium) and for grade XI is item 9 with a score 2.39 (medium) while the lowest mean for grade X and XI is item 10 with a score 0.76 (low) and 0.66 (low). On the topic of descriptive statistics, the highest mean for grade X and XI is item 13 with a score 1.98 (medium) and 2.02 (medium) while the lowest mean is item 16 with a score 0.42 (very low) and 0.36 (very low). On the topic of empirical sampling distributions, the highest mean for grade X is item 17 with a score 1.39 (low) and for grade XI is item 18 with a score 1.52 (medium) while the lowest mean for grade X and XI is item 19 with a score 0.76 (low) and 1.16 (low). On the topic of confidence intervals, the highest mean for grade X and XI is item 22 with a score 1.56 (medium) and 1.98 (medium) while the lowest mean is item 20 with a score 0.72 (low) and 0.70 (low). On the topic of randomization distributions, the highest mean for grade X and XI is item 25 with a score 2.15 (medium) and 2.61 (high) while the lowest mean is item 23 with a score 0.42 (very low) and 0.82 (low). On the topic of hypothesis tests, the highest mean for grade X and XI is 28 with a score 2.19 (medium) and 1.93 (medium) while the lowest mean is item 33 with a score 0.80 (low) and 0.66 (low). On the topic of scope of conclusions, the highest mean for grade X and XI is item 34 with a score 1.43 (low) and 1.36 (low) while the lowest mean is item 35 with a score 1.01 (low) and 0.77 (low). On the topic of regression and correlation, the highest mean for grade X and XI is item 36 with a score 2.19 (medium) and 2.20 (medium) while the lowest mean is item 37 with a score 1.43 (low) and 1.14 (low). These finding indicated that grade X students are still having difficulty with indicator "Understanding the properties of standard deviation" and "Understanding that sample statistics in the tails of a randomization distribution are evidence against the null hypothesis." While grade XI students are still having difficulty in with indicator "Ability to determine if a variable is an explanatory variable or a response variable."

Table 7 shows the highest mean average for grade X is the topic of regression and correlation, and for grade XI is the topic of data production, while the lowest mean average for grade X is the topic of scope of conclusions and for grade XI is topic of confidence intervals. This finding indicated that students' statistical literacy skills still need to be improved on the topic of scope of conclusion and confidence intervals. Table 8 shows that there is a significant difference by grade with sig. <0.05 on the students' statistical literacy.

Table 7. The result of students' statistical literacy skills based on grade

Topic	Grade X (first year)		Grade XI (second year)	
	Mean average	Description	Mean average	Description
Data production	1.80	Medium	1.93	Medium
Graphs	1.71	Medium	1.59	Medium
Descriptive statistics	1.41	Low	1.40	Low
Empirical sampling distributions	1.12	Low	1.36	Low
Confidence intervals	1.18	Low	1.13	Low
Randomization distributions	1.19	Low	1.52	Medium
Hypothesis tests	1.31	Low	1.15	Low
Scope of conclusions	0.88	Low	1.25	Low
Regression and correlation	1.81	Medium	1.67	Medium

Table 8. Multivariate based on grade

	Effect	Value	F	Sig.
Gender	Pillai's Trace	.086	2.731[a]	.005
	Wilks' Lambda	.914	2.731[a]	.005
	Hotelling's Trace	.094	2.731[a]	.005
	Roy's Largest Root	.094	2.731[a]	.005

3.4. Students' statistical literacy skills based on educational field

In this section, the students' statistical literacy skills were described according to the educational field. Table 9 shows the result of students' statistical literacy to the given the test. Based on the topic of data production, the highest mean for social class is item 8 with a score 2.71 (high) and for science class is item 4 with a score 2.71 (high) and 2.96 (high) while the lowest mean for social class is item 6 with a score 0.20 (very low) and for science class is item 7 with a score 0.40 (very low). On the topic of graphs, the highest mean for social and science class is item 9 with a score 2.23 (medium) while the lowest mean is item 10 with a score 0.60 (low) and 0.79 (low). On the topic of descriptive statistics, the highest mean for social class is item 14 with a score 1.97 (medium) and for science class is item 13 with a score 2.02 (medium) while the lowest mean is item 16 with a score 0.29 (very low) and 0.46 (very low). On the topic of empirical sampling distributions, the highest mean for social class is item 18 with a score 1.46 (low) and for science is item 17 with a score 1.71 (medium) while the lowest mean for the social class is item 17 with a score 1.11 (low) and for science class is item 19 with a score 0.82 (low). On the topic of confidence intervals, the highest mean for social and science class is item 22 with a score 1.49 (medium) and 2.20 (medium) while the lowest mean is item 20 with a score 0.80 (low) and 0.61 (low). On the topic of randomization distributions, the highest mean for social and science class is item 25 with a score 2.57 (high) and 2.32 (high) while the lowest mean is item 23 with a score 0.42 (very low) and 0.82 (low). On the topic of hypothesis tests, the highest mean for social and science class is item 28 with a score 1.91 (medium) and 2.14 (medium) while the lowest mean for social class is item 31 with a score 0.83 (low) and for science class is item 33 with a score 0.46 (low). On the topic of scope of conclusions, the highest mean for social and science class is item 34 with a score 1.69 (medium) and 1.07 (low) while the lowest mean is item 35 with a score 0.77 (low) and 0.95 (low). On the topic of regression and correlation, the highest mean for social and science class is item 38 with a score 2.23 (medium) and 2.17 (medium) while the lowest mean is item 37 with a score 1.06 (low) and 1.44 (low). These finding indicated that social students are still having difficulty with indicator "Ability to determine if a variable is an explanatory variable or a response variable." While science students are still having difficulty with indicator "Understanding the difference between a statistic and parameter."

Table 9 shows the highest mean average for social and science class is topic of data production with while the lowest mean average for social class is topic of confidence intervals and for science class is topic of scope of conclusions. This finding indicated that students' statistical literacy skills still need to be improved on the topic of scope of conclusion and confidence intervals. Table 10 shows that there is no significant difference by educational field on the students' statistical literacy.

Table 9. The result of students' statistical literacy skills based on educational field

Topic	Social		Science	
	Mean average	Description	Mean average	Description
Data production	1.86	Medium	1.91	Medium
Graphs	1.58	Medium	1.69	Medium
Descriptive statistics	1.39	Low	1.42	Low
Empirical sampling distributions	1.26	Low	1.30	Low
Confidence intervals	1.10	Low	1.20	Low
Randomization distributions	1.47	Low	1.33	Low
Hypothesis tests	1.21	Low	1.21	Low
Scope of conclusions	1.23	Low	1.01	Low
Regression and correlation	1.64	Medium	1.80	Medium

Table 10. Multivariate based on educational field

	Effect	Value	F	Sig.
Educational field	Pillai's Trace	.024	.727[a]	.684
	Wilks' Lambda	.976	.727[a]	.684
	Hotelling's Trace	.025	.727[a]	.684
	Roy's Largest Root	.025	.727[a]	.684

Students' statistical literacy on the topic of data production is medium. Data production based on gender, grade and educational field is also medium. However, the production of this data is important. Students not only collect data but can produce data [25]. Data production activities may include sharing data, including description, management, packaging, archiving and access. After the data is collected and processed it can be distributed digitally [26]. Data production also supports research collaboration [27]. Whereas this ability is very important for the process of recording, collecting, and generating data [28]. The results of this study indicate that there is no significant difference in statistical literacy based on gender. This finding is similar to

Auliya [29], where there is no significant difference in students' statistical literacy skills by gender. There are no statistically significant difference in the mean score depending on the gender variable [30]. Even in other studies, it is said that the feminine type can read data and is supported by arguments that are easier to understand [31]. Thus, it can be concluded that gender differences do not affect students' statistical literacy skills.

Students' statistical literacy on the topic of graphs is medium. This finding similar with previous study [32] stated that students have good performances in interpreting graph but have difficulty in constructing new graphs and performing tasks related to graphing skills. Setiawan and Sukoco [33] also concluded that students could not draw meaningful diagrams to show two groups of data. Graphing skills are useful for summarizing data sets, extracting new information from complex data, and interpreting them. Student graphing skill based on gender, grade, and educational field is also medium. This finding is similar to Bursal and Polat [34] that there is no significant difference in graphic ability by gender, but skill level affects graphic skills. Male and female subjects can read chart titles or topics, give meaning to chart units, find values or specific units, and read chart maximum and minimum values up to [7].

Students' statistical literacy on the topic of descriptive statistics is low. This finding is like Setiawan and Sukoco [33] in that students can calculate various descriptive statistics but cannot determine the right statistics to describe the data clearly. Descriptive statistics results based on gender, grade, and educational field are also low. Overall, students' statistical literacy skills are still at a low level. The low skills of students indicate that they have failed to master the required competencies related to statistical literacy even since the lower grades. In addition, other factors, such as the delivery of instructions, could be associated with their low level of statistical literacy [35]. This is also evidenced by the indicators that read the chart. Where in this indicator, the ability of students is also low. This finding support Hariyanti and Hidayanti [36] that most students are weak in interpreting the data presented in the form of pie charts. Maryati *et al.* [37] also found that students' ability to read statistical data provided in the form of tables, diagrams, and graphs was 35%, understanding concepts by 32%, and communicating data processing by 28% so that it can be categorized as still at a low level because many students are below the minimum completeness criteria. In other words, students' statistical literacy skills on the indicators of reading charts are also low.

4. CONCLUSION

This study aims to analyze students' statistical literacy skills based on gender, class, and field of education. In general, the statistical literacy skills of students are still at a low level. The lowest aspect is the scope of conclusions, while the highest topic is data production (medium level). In addition, there are no significant differences in statistical literacy skills based on gender and class. However, there are significant difference in statistical literacy based on field education. The results of this study indicate that efforts should be made by policy makers or teachers to improve students' statistical literacy skills by conducting training or applying a learning model that focuses explicitly on statistical literacy skills.

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BIOGRAPHIES OF AUTHORS

Riwayani is a Ph.D. Candidate, Doctoral Program in Science Education, Faculty of Mathematics and Natural Science, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. Her research focuses on physics education, e-learning, 21st century and literacy skills. She can be contacted at email: riwayani.2022@student.uny.ac.id.

Edi Istiyono is a Professor and Lecturer at Department of Physics Education, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. His research interests in evaluation in physic education, e-learning, and 21st century skill. He can be contacted at email: edi_istiyono@uny.ac.id.

Supahar is Lecturer at Department of Physics Education, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. His research interests in evaluation in physic education, e-learning, and 21st century skill. He can be contacted at email: supahar@uny.ac.id.

Riki Perdana is a Lecturer at Department of Physics Education, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. His research focuses on physics education, e-learning, 21st century and literacy skills. He can be contacted at email: rikiperdana@uny.ac.id.

Soeharto is a Ph.D. Candidate from the Doctoral school of education, University of Szeged, Hungary. His research interests are science education, educational psychology, and inductive reasoning skills in high schools and university contexts. He is an expert in quantitative analysis using structural equation modeling (SEM) and Rasch analysis. He is a writer and reviewer in well-known scientific journals indexed by Scopus and Web of Science. He can be contacted at email: soeharto.soeharto@edu.u-szeged.hu.