



## Student Statistical Literacy as An Initial Study for Sekolah Siaga Kependudukan in Indonesia : A Systematic Literature Review

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**Abstract:** This study aims to analyze studies on statistical literacy skills in Sekolah Siaga Kependudukan (SSK). Statistical literacy skill is part of mathematical literacy skill which is an assessment of students' mathematical abilities. The method used was a Systematic Literature Review (SLR) of all research articles indexed in Scopus, Sinta, Google Scholar, Semantic, and ERIC in the period 2018-2023. The search strategy was adjusted to the selection criteria. It used the PRISMA protocol with study characteristics such as education level, year of publication, research method, sample size, journal indexer, and research location. Data analysis of this study was conducted in a quantitative descriptive manner. The results of this SLR study stated that research related to students' statistical literacy skills has relatively increased research trends over the past five years. The research database that has been published and is the result of SLR research shows that most journal indexers are Q2 rank Scopus and are dominated by qualitative research. The majority of research locations were carried out in Indonesia in accordance with the existence of the Sekolah Siaga Kependudukan, which only exists in Indonesia. Further research recommendations can accommodate statistical research and learning with collaborative modules and student activities so as to improve aspects of statistical literacy skills in the form of interpreting, communicating, evaluating, and making data-based decisions.

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## Introduction

Learning mathematics at the elementary school to the college level is inseparable from statistics material. Starting from numerical learning by sorting numerical data from smallest to largest in low-grade elementary school material to inferential hypothesis testing in statistical learning in college. This means that learning statistics has become an essential material in the curriculum of mathematics subjects in Indonesia in various curriculum developments that have been running. Recently, through the Merdeka curriculum, special elements in the form of statistics were given for each phase level of phases A, B, C, D, E, and F (Mariati et al., 2021).

The application of statistical material in everyday life is easier for students and students to find so that logical reasoning and statistical material can be easily understood. In the initial phase, statistics lessons are intended to provide students with knowledge related to public data exposure so that it can be directly used to solve the problems they face. It also indicates the importance of statistical literacy in the early phases of learning mathematics. Statistical literacy skills are useful for preparing students as a generation that is ready to face the challenges of the 21st century (Istiningsih & Dharma, 2021). Some of the reasons that



make statistical literacy important for students to learn include the rapid rate of information about human life and that it involves subjective argumentation based on statistical data (Callingham & Watson, 2017). If this ability or understanding cannot be mastered properly by everyone, it will result in being easily consumed by issues or information that is still unclear or called *a hoax*. Kurnia's opinion states that there are concerns for students aged 15 to 16 years in developing countries whether they have adequate abilities when facing dominant data-based problems (Kurnia et al., 2023). It is also the hope of other researchers who say that the output of students who attend school is expected to have statistical literacy skills (Gunawan et al., 2023).

In a sense, statistical literacy can be interpreted as statistical literacy. It is said to be literate if the individual already can read and understand data from the problems being faced and then analyze and evaluate the data both computationally and planning so that they can make decisions based on appropriate statistical reasons (Gonda et al., 2022). Through this understanding, statistical literacy skills become skills needed by today's society (Almašiová et al., 2021). This ability will indirectly hone individuals in solving problems (Inriani et al., 2022) faced if what is found is data-based. Previous research from Ocean of Data Science (2015) states that someone who has good statistical literacy will be able to easily identify, collect, interpret, display, correct, and communicate data. Furthermore, statistical literacy skills consist of understanding problems, processing data, and interpreting data (Utomo, 2021).

Subject matter that can develop statistical literacy is a lesson that can integrate issues in social life and is data-based (Kartikasari & Hidayah, 2022). In Indonesia, there are Sekolah Siaga Kependudukan (SSK) that have programs to integrate population issues or Indonesian demographic bonuses in school learning materials (Septiani et al., 2022). It is an opportunity for schools to facilitate students in developing statistical literacy in the literacy corner at SSK. Definitely, SSK is a school that integrates lessons with population education, family planning (KB), and family development through subjects and/or population lessons on special local content (Abdiyah et al., 2020). One example of statistical material content in phase D mathematics lessons related to population issues as an effort to improve students' statistical literacy skills is as follows.

Based on data from the Central Statistics Agency (<http://www.bps.go.id/>), the percentage of open unemployment (TPT) in Indonesia in February 2023 is 5.83%. If 4 people are taken randomly, calculate the chances of taking 0, 1, 2, 3, 0, 1, 2, 3, and the 4 people are open unemployed. The answer is to use the binomial probability of occurrence approach with the formula  $P(x) = \binom{y}{x} p^x q^{y-x}$  where  $P(x)$  is the chance of taking  $x$  people of offense and  $y = 4$  returned from the Indonesian Central Bureau of Statistics (Nasution, 2020), the results of the Indonesian population census in September 2020 amounted to 270.2 million people. The large number of Indonesians in that year was influenced by the population growth rate of 1.25 per year. It is also followed by a crude birth rate of 18 per 1,000 people and the phenomenon of democracy bonus in the form of an increase in the Indonesian population, which is classified as the working age category of 15-64 years as much as 70.72%. Integrating population issues can be material in mathematics or other subjects (Ulfah, 2021). By referring to various research results related to statistical literacy above, the purpose of this study is to analyze studies on students' statistical literacy skills in Sekolah Siaga Kependudukan (SSK) in Indonesia. It is intended to be a preliminary study in future research for Sekolah Siaga Kependudukan.



## Research Method

The method used in this study was a *Systematic Literature Review* (SLR) (Aziz & Rosli, 2021). This research approach used a quantitative descriptive approach (Rahmawati & Juandi, 2022) through secondary data, namely in the form of basic research results on students' statistical literacy abilities. The research stages passed were data collection, data analysis, the next is drawing conclusions (Juandi, 2021). Data was collected in the form of primary research that had been published in international and national journal articles, data collected from *electronic databases* registered and indexed by Scopus, Sinta, Google Scholar, Semantic Scholar, ERIC, and direct URLs of international journals. Next, an extraction of all found articles was carried out. Articles that met the inclusion criteria that the researchers had set as characteristics of the next study would be the material for analysis. The data collected was in the form of research results on statistical literacy, which were then extracted with study characteristics based on the year of publication, education level, research subject, research location, and journal ranking. Then analyzed and explored based on research methods and findings in the study in order to find research characteristics related to statistical literacy skills.

The inclusion criteria used to obtain data in accordance with the research objectives are: (1) articles containing research on statistical material; (2) The study has a focus on statistical literacy ability analysis (3) The research sample is elementary school students (SD) to students at universities (PT); (4) The study lists the level of education of the research subject; (5) studies using a representative number of samples or participants (6) research conducted has been published from 2018 to 2023; (7) The study lists the approach or method used. Primary research that has been reviewed and does not meet the inclusion criteria is excluded from this systematic review process.

The population in this study was all studies related to statistical literacy skills and had been published in scopus indexed journals. Based on a search using a search engine and assisted by publish or perish 8, 101 samples were found. Furthermore, a review was carried out with the PRISMA protocol and finally obtained 15 articles used in the study.

Research instruments in the form of observation sheets or protocols related to inclusion and exclusion criteria with criteria based on the year of publication, level of education in the research sample, research class, location of research implementation, journal indexer, and learning materials used for research. The protocol that the author used was the PRISMA Protocol (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*). The research selection process was carried out through stages: *identification*, *screening*, *eligibility*, and *included* (Helsa et al., 2022). Data analysis techniques on SLR were carried out at the stage of determining the quality of research articles in accordance with inclusion and exclusion criteria so that articles are obtained to be analyzed to draw conclusions.

## Results and Discussion

This SLR research used secondary data, a database in Scopus intended to be published in journal articles, proceedings, and book reviews/chapters related to statistical literacy. The results of SLR research will show the characteristics of the research studied by researchers according to inclusion and exclusion criteria (Juandi, 2021).

### *Selection of Characteristics of Studies*

The determination of inclusion criteria as a study characteristic is a consideration for selecting relevant studies. Articles are further categorized based on the characteristics of the study, namely the year of publication, the level of education in the research sample, the



location of the research implementation, journal indexer, sample size, and the method used by the research. Quantitative data are displayed to see the diversity of statistical literacy skills based on the characteristics of the study in table 1 below.

**Table 1. The number of studies based on characteristic criteria**

Characteristics	Criteria	Frequency
Year of Publication	2018	2
	2019	1
	2020	1
	2021	2
	2022	6
	2023	3
Education Level	SD	1
	SMP	4
	SMA	2
	PT	8
Research location	Indonesia	8
	ASEAN (Malaysia)	1
	Benua EROPA	3
	Benua AMERIKA	3
Journal Indexer	Q1	3
	Q2	5
	Q3	2
	Q4	1
	SINTA 2	2
	SINTA 4	1
	WOS	1
	Sample size	1-30 (6, 9, 23)
	31-60 (32, 45, 50)	3
	61-90	0
	91-120 (96, 114)	2
	121-150	0
	151-180 (163)	1
	181-210 (198)	1
	211-500 (468)	1
	501-1500 (1265)	1
Research methods	Correlational analysis	2
	Descriptive analysis	1
	Development research	1
	Longitudinal design	1
	Qualitative research	3
	Quantitative descriptive	1
	Quantitative research	2

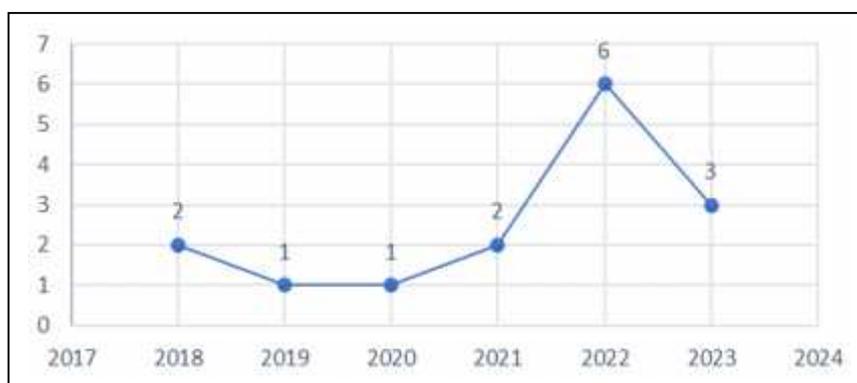


	Rasch model analysis	2
	Structural equation modeling	1
	Survey	1

**Study Characteristics Based on Year of Publication**

Studies on systematic research of the review literature used are those that have the characteristics of the last 5 years of publication from 2018 to 2023. The distribution of studies from 2018 to 2018 is presented in the graphic image below.

Study Distribution by Year of Publication

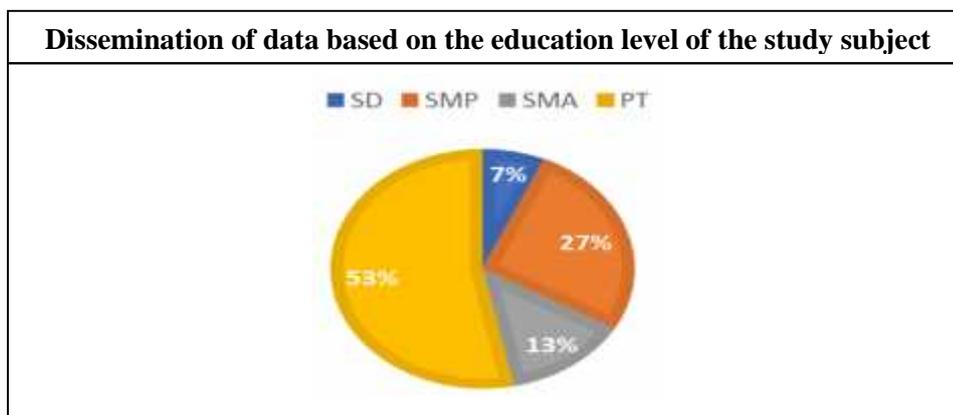


**Figure 1. Distribution of published data from primary studies of statistical literacy skills that have been published**

Based on Figure 1. It was concluded that the number of publications on the statistical literacy ability of students and students from year to year has relatively increased and is indexed internationally on Scopus and nationally on Sinta. Journal indexers that are the focus of systematic research on review literature include: *Education Science, Egitim ve Bilim, Electronic Journal of e-Learning, Infinity Journal, International Journal of Education in Mathematics, Science and Technology, Journal of Education and e-Learning Research, Journal of Higher Education Theory and Practice, Journal of Research in Science Teaching, Journal of Statistics and Data Science Education, Mathematics Education Journals, Mathematics Education Research Journal, New Educational Review, Pertanika Journal of Social Sciences and Humanities, Statistics Education Research Journal, dan Teaching Sociology.*

**Characteristics at the Education Level**

Systematic research of this review literature has the characteristics of research objects from elementary school to college students. The distribution of many studies with the characteristics of education levels from elementary school to college is presented in the following graphic image.

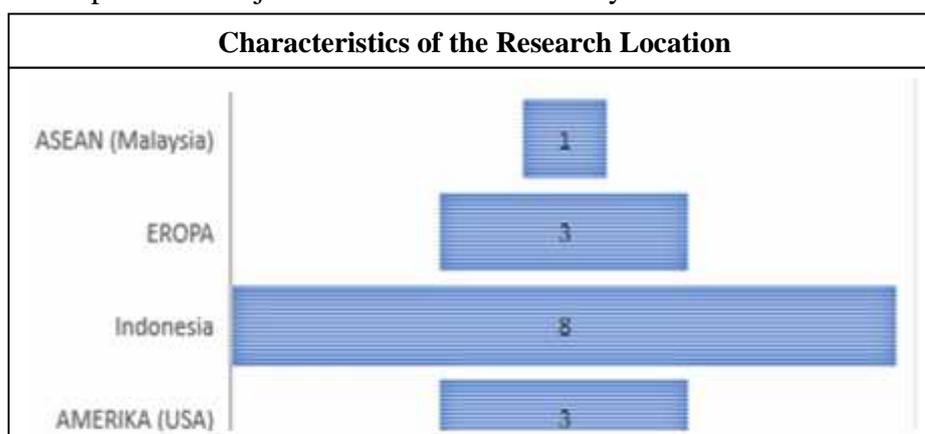


**Figure 2. Distribution of primary data based on the characteristics of the object of study**

Based on figure 2, researchers mean that statistical literacy skills are relatively widely researched, studied, and analyzed at the level of higher education. However, in the last five years studies on statistical literacy skills have also been examined at the junior high school level, but no research has been found at the primary school education level. This is something that deserves to be discussed because statistics subject matter has been taught to elementary school to college students. If the mastery of statistical concepts has been mastered by elementary school students, they will not have difficulty when they will meet statistics students in college. This is because statistical literacy skills in universities are expected by students to be able to make the right decisions when they have understood the data faced and have been able to analyze and evaluate the data.

**Characteristics Based on Research Location**

The characteristics of this research study based on the location of the research carried out are illustrated in the graph below in figure 5. Based on these images, primary data was obtained, the majority of which were carried out abroad, while in Indonesia there were only a few. This is because journal indexers from scopus and those from Indonesia are indexed sinta and the exclusion process is adjusted to the criteria of study characteristics.

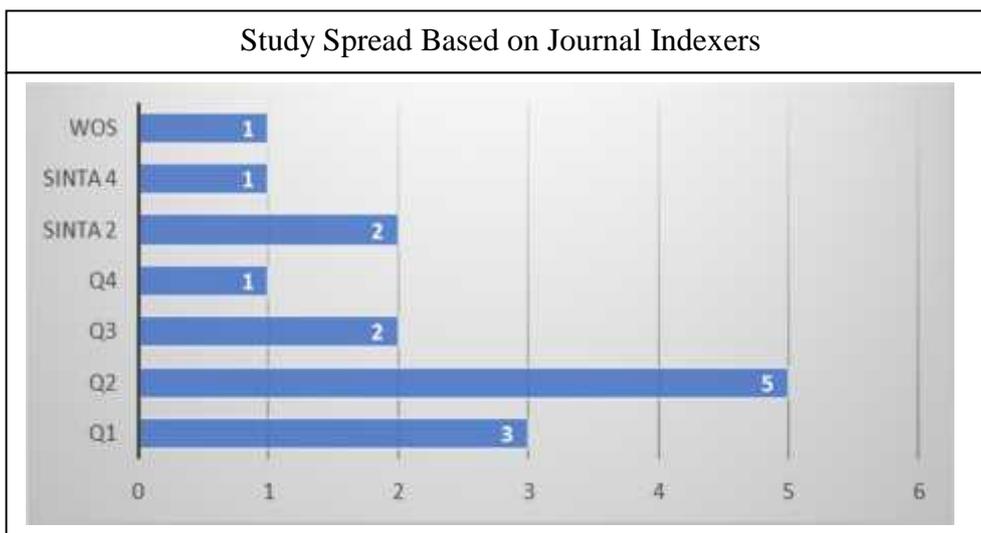


**Figure 3. Graph of primary data distribution based on the location of the research conducted**



**Characteristics Based on Journal Indexers**

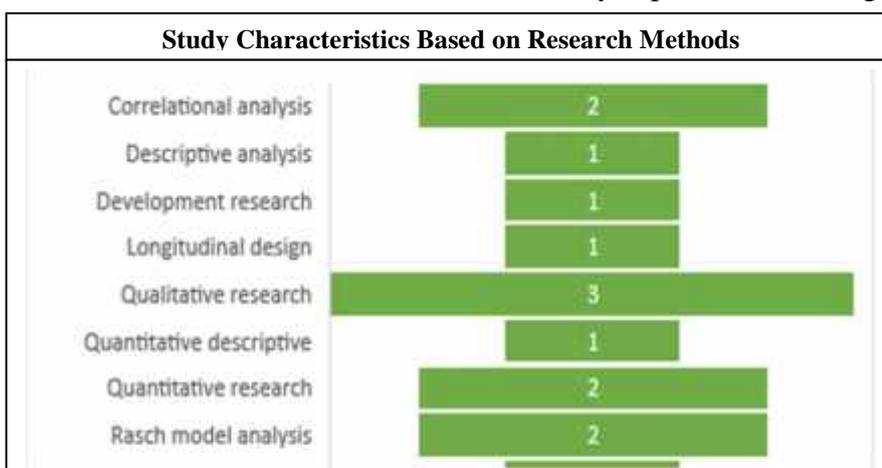
Journal indexers on primary data used in systematic research of review literature are spread across international to national rankings. In international rankings indexed by Scopus, they are in the Q4 to Q1 ranking category. While those that are nationally indexed in Sinta are ranked Sinta 2 and 4. In addition, there is a journal indexer found on the *Web of Science* (WoS). The distribution of primary data is presented in the graphic image as follows.



**Figure 4. Primary data distribution graph based on journal indexer**

**Research Characteristics on the Methods Used**

The research method used in the study analyzed was distracted based on these inclusion criteria. The method used is dominated by research with a qualitative approach. In addition, there are other research approaches used by researchers in exploring students' statistical literacy abilities. The distribution of the types of approaches, designs, or research methods used that form the basis of the characteristics of the study is presented in the graph below.



**Figure 5. Characteristics of studies extracted based on research methods**

**Discussion**

*Characteristics Based on Research Results on Statistical Literacy Ability*

The results of research on Statistical Literacy Ability for students and students whom researchers have analyzed display the research methods or approaches carried out. The results of the analysis show variations in conducting research to review statistical literacy skills with



qualitative, quantitative, longitudinal, and experimental methods and surveys. Based on extraction, the results of the research obtained among others, mention the importance of in-depth statistical literacy in the educational curriculum for K-8 in the United States (Weiland & Sundrani, 2022). Another thing that is more in-depth related to statistical literacy skills as a result of systematic research activities in this review literature is the acquisition of dimensions or aspects of statistical literacy abilities, namely, there are 2 dimensions, knowledge and attitudes (Lukman et al., 2022). In these 2 dimensions, supporting elements were obtained for the formation of statistical literacy skills, descriptive statistics, statistics, inference, communication, statistics, and statistical thinking. Furthermore, the attitude dimension is built by 2 elements, namely confidence and critical attitude.

The characteristics of the study seen based on the results of the study provide additional information that is more focused and findings so that it can be reinforced in deepening statistical literacy skills that are suitable in Sekolah Siaga Kependudukan. The results of other studies say that the use of modules when learning statistics will have a positive impact on statistical literacy skills. It is an alternative answer to obstacles to population education in Sekolah Siaga Kependudukan so far, which still lacks teaching materials with good validity.

This opinion is also reinforced by research conducted by Lilis and Vivin (2023), who want to see the impact of using interactive multimedia learning media. The results also showed that there was a significant influence when using these media (Angraini & Hardi, 2023). In addition, the results of the analysis conducted by Wahab, Mahmud, and Tiro found research results that stated that after using modules that facilitate statistical literacy, literacy and statistical learning achievement increased from medium to high categories (Wahab et al., 2018). Not only that, the analysis also presents conclusions based on empirical tests which state that learning with the module is quite effective in increasing statistical literacy learning achievement. The statistical literacy ability that is an aspect of this assessment is the concept, application, calculation, and interpretation of simple linear regression. Learning Achievement in statistical elements will be part of student learning outcomes at the level or phase of student learning outcomes (Setiawati et al., 2023).

The results of research conducted in Malaysia with the RASCH Model analysis technique on a survey of 356 junior high school students showed the results that there is a need to provide learning experiences for students to better connect calculation and literacy skills (Lian et al., 2022). The results of this study support the results of the analysis that has been carried out by Fiedler, Sbeglia, Nehm, and Harms, which states that the role of statistical reasoning can be a motivation to increase knowledge in calculating evolutionary education in the future (Fiedler et al., 2019). Therefore, it is necessary to strengthen the preparation of appropriate instruments in the development of statistical literacy skills so that they can properly interpret empirical data on the development of research subject knowledge effectively.

Learning activities with statistical content will have a very good impact on student engagement through direct activities so that they can achieve a higher level of statistical literacy. The results of this study are also reinforced by the opinions expressed by Domu, Ichdar, Pinontoan, Kinzie, Mangelep, and Navel Oktaviandy, who stated that the active involvement of students (research objects) makes the classroom more lively even if learning using e-learning is carried out (Domu et al., 2023).

Statistical literacy ability has indicators, one of which is being able to represent mathematically. It is empirically proven based on inferential tests conducted by Takaria,



Wahyudin, Sabandar, and Dahlan with a correlation value of 0.66 for positive influence and a strong relationship between statistical literacy and mathematical representation (Takaria & Talakua, 2018). In straightforward terms, students who have good mathematical representation skills then their statistical literacy skills also become better. The benefits of statistical literacy skills are also felt for students who receive postgraduate education. In postgraduate education, the ability to research needs to be honed as well as possible both from statistical methodology, logic and statistical reasoning to support their research interests.

### **Conclusion**

The conclusion obtained from the results of this study is that in the last five years from 2018 to 2023, there tends to be an increase in research trends related to statistical literacy. Furthermore, the subject of research related to statistical literacy is in students in universities. Journal indexers in the studies analyzed are dominated by Q2 rank Scopus, and the research method used by the majority is a quantitative approach. The results of this study imply that the characteristics of previous studies related to statistical literacy, if applied in Sekolah Siaga Kependidikan, can be taken the next step, namely, the selection of research subjects at the school level needs to use non-burdensome content. Moreover, quantitative research approaches such as experiments can be one of the priority alternatives for conducting statistical literacy research in schools.

### **Recommendation**

Recommendations for future researchers who will measure statistical literacy can read previous research as references to consider the right indicator in representing statistical literacy according to the subject of research. In addition, the research method must also be adjusted to the needs of measuring statistical literacy for future research subjects. Especially for students in Sekolah Siaga Kependudukan, the subjects of research are students in schools (junior high or high school) with differences in the achievement of statistical learning to develop statistical literacy.

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