RESEARCH ARTICLE

How environmental literacy research works in biology learning? A literature review

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Abstract: Environmental problems are a factor that influences the health of the world's great population. Developed countries make pollution part of a serious problem in urban industrial centers. The aim of this research is to address the following objectives: (1) to analyze the trend in the number of environmental literacy research conducted annually; (2) to identify the methodologies employed in investigating environmental literacy in Indonesia; (3) to determine the demographics of research subjects involved in studies related to environmental literacy; (4) to ascertain the geographic locations utilized as research sites for studies concerning environmental literacy. This research focuses on content analysis that has been determined from various research published in scientific journals in Indonesia and international journals. In this research, the focus is on articles discussing environmental literacy in Indonesian journals indexed by SINTA. There are 24 articles discussing environmental literacy. positive trends were found in research related to environmental literacy. Among these articles, quantitative research is often found. The samples found in the article were mostly found in junior high schools. Apart from that, the data collection used was a test instrument. and most often use independently composed instruments. In light of the findings of this study, several recommendations have been made for further research.

Keywords: biology and science journal; content analysis; environment literacy

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Article history:
Received: 23 December 2023
Revised: 14 February 2024
Accepted: 15 February 2024
Published: 26 March 2024

10.22219/jpbi.v10i1.31291

p-ISSN: 2442-3750
e-ISSN: 2537-6204

How to cite:
Awaludin, J., Kurniati, T. H., Ristanto, R. H., & Komala, R. (2024). How environmental literacy research works in biology learning? A literature review. *JPBI (Jurnal Pendidikan Biologi Indonesia), 10*(1), 131-142. https://doi.org/10.22219/jpbi.v10i1.31291

Introduction

One of the biggest problems in this era is air pollution, not only because of its impact on climate change, but also because of its impact on public and individual health as it increases morbidity and mortality. There are many pollutants that are major factors in human disease (Manisalidis et al., 2020). Rapid anthropogenic environmental change is essential challenges associated to bring together different disciplines so that we have a detailed and integrated picture of our current state as well as the ability to avoid, reduce or mitigate emerging problems (Sauvé et al., 2016). Another problem discovered is Climate Change. Global climate change has become one of the most significant challenges to human development, dramatically driving global political consensus and significant action to address climate change (Wu et al., 2023). Education can play a role in world problems (Jakubik, 2022; Sharma & Ankit, 2023). The success of education lies in its ability to cultivate individuals who are equipped to tackle everyday challenges (Korshunov et al., 2023; Lawy, 2014). Environmental education aims not only to influence an individual's inner thinking and understanding of the world, but also ultimately to intrinsically motivate people to behave appropriately in real life (Otto & Pensini, 2017).

People perform activities in their daily lives that have caused various negative effects on balance of the environment. Irresponsible human activities often have the greatest impact on environmental change order (Wu et al., 2023). Indonesian people's low interest in the environment may also be due to a lack of environmental awareness. People perform activities in their daily lives that have caused various negative effects on balance of the environment (Pangestu et al., 2023). Public education and awareness regarding climate change is very important to encourage and achieve sustainable development. Various

international bodies, NGOs and governments are involved in improving the quality and inclusion of education to combat climate change and this is reflected in the fourth sustainable development goal in the 2030 Agenda. The literature states that society must become environmentally literate as a solution or mitigation to new and destructive environmental problems (Shamuganathan & Karpudewan, 2015).
Environmental literacy can be interpreted as knowledge about the natural environment and its relationship with humans whose mission is to protect it (Mustofa, 2023). Individuals who have environmental literacy can have an alarming mindset towards their environment, this is evidenced by using which states that environmental literacy can form an alarming mindset towards their environment (Pangestu et al., 2023).
There are some very important imperatives for environmental literacy research, especially as environmental issues become more complex and pressing. Educating students about environmental literacy helps create a generation that cares about and understands the importance of conserving and protecting the natural environment for the sustainability of the planet (Mustofa, 2023). In Indonesia there is also a lot of research on environmental literacy. there are several that focus on analyzing learning models, learning media and learning tools that can increase environmental literacy (Noverita et al., 2023; Rahman & Leman, 2021), there are also those who discuss the relationship between environmental literacy and the parameters of student learning achievement (Khuluq et al., 2022) Several research results on environmental hygiene behavior were obtained as a basis. there is a relationship between individuals and their clean behavior in society. Next, there is a metaphorical connection between environmental cleanliness, morals and behavior (Yusuf et al., 2022). There are several studies that carry out environmental literacy analysis in several regions (Pangestu et al., 2023; Ridwan & Ramdhan, 2021). However, of all the research related to environmental literacy, there is still no research that reviews the information that has been reported in all research.
This study utilizes content analysis of multiple scientific journals within the fields of Biology education and science education published in Indonesia. Its primary objective is to gather insights from various studies concerning environmental literacy in the country. Specifically, the research seeks to address the following inquiries: (1) What is the trend in the volume of environmental literacy research over time? (2) What methodologies are employed to explore environmental literacy in Indonesia? (3) Who are the subjects of research pertaining to environmental literacy? (4) What are the primary locations utilized as research sites concerning environmental literacy?

Method

This research focuses on content analysis that has been determined from various research published in scientific journals in Indonesia. The research method uses the same method as research related to content analysis (Susetyarini & Fauzi, 2020).
The data comes from the results of the content analysis of national and international articles. All national articles are taken from biology education journals and science education journals registered with SINTA. SINTA (https://sinta.kemdikbud.go.id/) is an information system and index developed by the Indonesian Ministry of Education, Culture, Research, and Technology. SINTA functions to monitor and assess the quality of scientific journals published in Indonesia. There are 41 biology education journals and 12 science education journals. There are hundreds of articles contained in the following journals: Next, all articles related to environmental literacy or environmental literacy were collected from each of these journals. There are 24 articles that examine environmental literacy. To compare research design and analytical data.
This research considers several aspects that are used as references in preparing research instruments. This research instrument adapts the research instrument prepared by Susetyarini and Fauzi (2020). The observed aspects are contained in the research instrument in the Table 1. Researchers grouped sample articles into number of publications and uses eight main indicators for content analysis including: 1. Type of Research; 2. Research Subject; 3. Data Collection Instruments; 4. Preparation of Research Instruments; 5. Topic chosen for the studies; 6. Data Analysis; 7. Result Findings; 8. Research Location. Indicator Type of Research (1) was divides into two sub-aspects, including 1a. general types of research and 1b. quantitative research.
Each sample article was Classified into a certain category depending on the indicators in the articles. Classification is based on information obtained from articles in the abstract, method, discussion sections. Next, the data is presented in diagram form. The data from the articles under review are presented in Table 2.

Results and Discussion

Number of Publication

The number of publications of scientific articles indicates that research was conducted during this period.

Figure 1 shows that a sample of national articles related to environmental literacy was found since 2017. The results formed a positive trend until 2023, when 10 scientific articles were found related to environmental literacy. The increase in the publication of scientific articles shows that the enthusiasm of researchers to research on environmental literacy. This can have implications in the world of education. The implications of research results in the world of education are 1. Increased knowledge and understanding of various aspects of life, be it nature, humans, or society. 2. Development of new theories and concepts in various fields of science. 3. Improving the quality of education and can be a reference source for educators and students.

Table 1. Indicators and categories used in content analysis research in the study, modified the aspects and categories used for content analysis in the study (Susetyarini & Fauzi, 2020)

Indicator	Categories	
Type of Research	A-1 R & D	A-3 Qualitative Research
	A-2 CAR	A-4 Quantitative Research
Types of quantitative research	B-1 Observation Studies (OB)	B-5 True Experimental Designs (TED)
	B-2 Correlational Research (CR)	B-6 Quasi Experimental Designs (QED)
	B-3 Survey Research (SR)	B-7 Ex Post Facto Designs (EPFD)
	B-4 Pre-Experimental Designs (PED)	B-8 Comparative Research
Research Subject	C-1 VII Grade JHS Students	C-7 Undergraduate students (US)
	C-2 VIII Grade JHS Students	C-8 Postgraduate students (PS)
	C-3 IX Grade JHS Students	C-9 JHS teacher
	C-4 X Grade SHS Students	C-10 SHS teacher
	C-5 XI Grade SHS Students	C-11 Lecturer
	C-6 XII Grade SHS Students	C-12 Prospective teacher
		C-13 Public (P)
Data Collection Instruments	D-1 questionnaire sheet	D-4 interview sheet
	D-2 observation sheet	D-5 unidentified
	D-3 test sheet	
Preparation of Research Instruments	E-1 Adopted the North American Assosiation for Enviromental Education (NAAEE)	E-3 Adopted Programme for International Student Assessment (PISA)
	E-2 Adopted the Middle School Environmental Literacy Survey (MSELS)	E-4 Environmental Literacy Assessment of Indonesian Students (ELAIS)
		E-5 The instrument was prepared by researchers
Research Location	F-1 Java Island	F-5 Bali and Lombok Island
	F-2 Sumatra Island	F-6 Papua Island
	F-3 Kalimantan Island	F-7 Sulawesi Island
	F-4 NTT and NTB Island	

Table 2. Research data sample

No	Journal	Year	Vol	No	Author	Research Type	Quantitative Research	Research Subject	Instrument Research	Instruments used	Location
1	Bionatural	2023	10	2	Anisa Noverita, Eka Darliana, Trysanti Kisria Darsih	R & D Research		VII Junior High School	Pretest Posttest	self-drafting	Sumatra Island
2	Bionatural	2023	10	2	Masdelina Sipahutar, Khairuna, Syarifah Widya Ulfa	Qualitative Research		X SMA	Test,	NAAEE	Sumatra Island
3	Bioed: Jurnal Pendidikan Biologi	2020	8	1	Muhammad Ridwan, Fachrul Ramdhan	Quantitative Research	Survey Research	VII Junior High School	Test	self-drafting	Java Island
4	Jurnal Biologi dan Pembelajarannya	2018	5	2	Nurul Mauludah, Fenny Roshayanti, Sumarno	Quantitative Research	Quasi Experimental Design	X Senior High School	Test	MSELS	Java Island
5	Biodidaktika	2021	16	2	Pipit Marianingsih, et al	Qualitative Research		X Senior High School	Documents Research	self-drafting	Java Island

No	Journal	Year	Vol	No	Author	Research Type	Quantitative Research	Research Subject	Instrument Research	Instruments used	Location
6	Bioedukasi	2023	21	2	Silvi Dwi Pangestu, Mimien Henie Al Muhdhar, Sulisetijono	Quantitative Research	Survey Research	XI Senior High School	Test	MSELS	Java Island
7	JPBIO	2023	8	2	Ade Suryanda, Nurmasari Sartono, Reyhanah	Quantitative Research	Quasi Experimental Design	X Senior High School	Test	self-drafting	Java Island
8	JPBIO	2023	8	2	Kurnia Utami, RR. Hertien Koosbandiah Surtikanti, Amprasto	Quantitative Research	Survey Research	X Senior High School	Test	MSELS	Sumatra Island
9	Edubiodik	2023	8	1	Ali Mustofa, Sueb	Quantitative Research	Survey Research	VIII Junior High School	Test	self-drafting	Java Island
10	Bioscience	2023	7	2	Mouria Bidarinjani, Abdulkadir Rahardjanto, Dwi Setyawan	Quantitative Research	Survey Research	Public	Test	MSELS	NTB Island
11	Quagga	2021	13	2	Nina Herlina, Purwati Kuswarini Suprapto, Diki Muhamad Chaidir	Quantitative Research	Quantitative Comparison	XI Senior High School	Test	NAAEE	Java Island
12	JPB	2022	13	1	Rif'atul Chusnul Khuluq, et al	Quantitative Research	Quantitative Comparison	XI Senior High School	Test	MSELS	Java Island
13	Jurnal Pendidikan Biologi	2018	9	2	Murni Sapta Sari, Sunarmi, Eko Sri Sulasmi	Quantitative Research	True Experimental Design	Undergraduate Students	Test	TOSLS	Java Island
14	JOBI	2022	8	1	Anggi Angreani , S. Saefudin , Rini Soliha	Quantitative Research	Quasi Experimental Design	X Senior High School	Test	NAAEE	Java Island
15	JOBI	2022	8	1	I Made Surya Hermawan , et. al	Quantitative Research	Survey Research	X Senior High School	Test	ELAIS	Bali Island
16	Jurnal Pengabdian Magister Pendidikan IPA	2021	2	4	Kumala Ratna Dewi, Priyo Hartanto, Ainun Jariah, Jamaluddin	Quantitative Research	Quasi Experimental Design	VII Junior High School	Test	self-drafting	NTB Island
17	Inkuiri	2017	6	1	Ari Maryani, Suciati Sudarisman, Sugiyarto	R & D Research		X Senior High School	Test	self-drafting	Java Island
18	natural science	2022	8	1	Nanda Syah Putra	Quantitative Research	True Experimental Design	Public	Test	NAAEE	Sumatra Island
19	Jurnal Pendidikan Matematika dan IPA	2023	14	1	Sabila Yasaroh, Insih Wilujeng, Sri Atun, Mega Indah Puspita Sari	Quantitative Research	Survey Research	VII Junior High School	Test	self-drafting	Java Island
20	Jurnal Pendidikan Matematika dan IPA	2020	11	1	Lenny Prastiwi, Diana Vivanti Sigit, Rizhal Hendi Ristanto	Quantitative Research	Survey Research	XII Senior High School	TEST	self-drafting	Java Island
21	Prisma Sains	2023	11	2	Intan Nurul Qomariansyah , H. Husamah, Fuad Jaya Miharja	Quantitative Research	Survey Research	Public	questioner	self-drafting	Java Island
22	Jurnal Pendidikan IPA Indonesia	2021	10	4	N. S. Putra, H. N. Sukma, H. Setiawan	Qualitative Research		Public	TEST	self-drafting	Sumatra Island

No	Journal	Year	Vol	No	Author	Research Type	Quantitative Research	Research Subject	Instrument Research	Instruments used	Location
23	Jurnal Pendidikan IPA Indonesia	2020	9	2	E. Suryawati, F. Suzanti, Zulfarina, A. R. Putriana, L. Febrianti	Quantitative Research	Quasi Experimental Design	VII Junior High School	TEST	MSELS	Sumatra Island
24	Jurnal Pendidikan IPA Indonesia	2019	8	4	I. Wilujeng, W. S. B. Dwandaru, R. A. Binti A. Rauf	Quantitative Research	Quasi Experimental Design	VII Junior High School	TEST	self-drafting	Java Island

Environmental Literacy is a major concern in environmental conservation efforts. Literature suggests that as a solution or to curb the emerging destructive environmental problems the society needs to be environmentally literate. Environmental problems the society needs to be Environmentally Literate (EL) (Otto & Pensini, 2017; Shamuganathan & Karpudewan, 2015; Wu et al., 2023). This is because environmentally literate citizens will behave in a more responsible way in protecting the environment and tend to perform more responsibly. protecting the environment and tend to perform more REBs (Stevenson et al., 2013). Environmental pollution is one of the serious environmental problems, research related to environmental literacy can be one of the efforts in encouraging environmental sustainability.

The development of Indonesian research is inseparable from the educational policies formulated by the government, research related to environmental literacy in 2023 has experienced a drastic increase, which can be attributed to the curriculum or policy that is now running, namely the Merdeka curriculum. The Merdeka curriculum gives institutions and students the freedom to shape learning from a conceptual point of view (Faiz et al., 2022; Wicaksono et al., 2021). The Merdeka curriculum is designed with learning needs in mind, taking into account the level of achievement and the current stage of student development. One of the efforts to socialize the concept of independent learning in the current National Education System is differentiated learning (Fitra, 2022; Supriadi & Hignasari, 2019). Educators have the freedom to choose from a variety of teaching methods to tailor their teaching to the diverse interests and needs of their students. Teachers can also implement differentiated learning by choosing an evaluation model. Differentiated learning is an attempt to customize the classroom learning environment to the unique needs of each student.

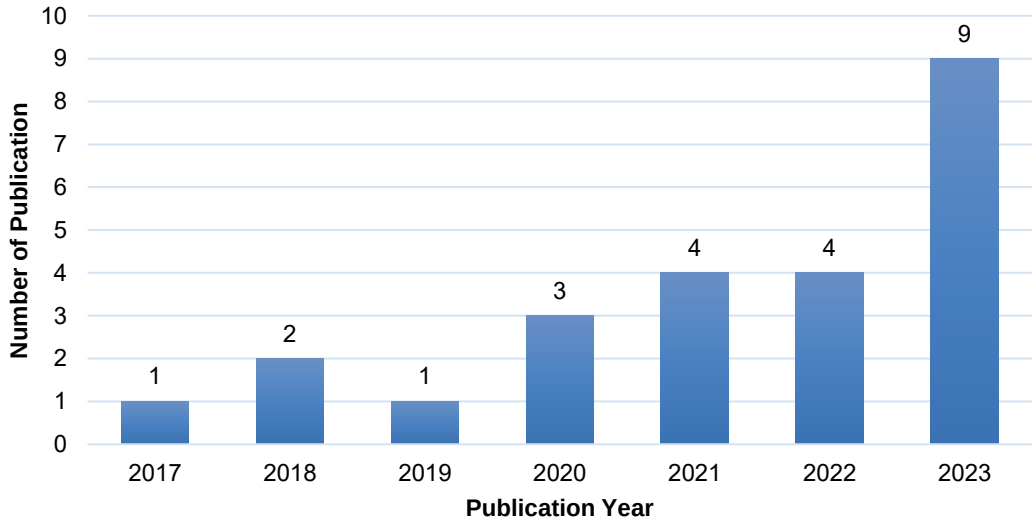

Figure 1. Story board e-comic nervous system

Type of Research

Research type influences the focus of the research, while research design is a plan that explains how the research will be conducted. The research design includes aspects such as research population and samples, data collection methods, and data analysis methods. articles presented in the Figure 2. Based on Figure 2, the quantitative research types are still dominantly used in research related to environmental literacy. The greater number of quantitative research compared to other types of research is in line with several previous studies that reported that researchers prefer quantitative research designs to conduct research in the field of education, rather than qualitative.

Qualitative research is considered necessary in education because it can provide a deeper understanding of social phenomena, such as learning, teaching and evaluation. Qualitative research can

help educators to understand students' experiences, the challenges faced by students, and the factors that can affect learning success. Meanwhile, R&D research is needed because it can produce new products and services that can improve the quality of learning. R&D can be used to develop new curricula, learning methods, and educational tools

However, the findings that reveal the scarcity of R&D research on environmental literacy are refuted by Fauzi and Pradipta's (2018) research. Their research claims that R&D research was the most selected and published type of research in 2017 (Fauzi & Pradipta, 2018). R&D research is one of the latest trends in educational research in Indonesia. In this kind of research, researchers often produce educational products based on the results and process of pure Biology research that they have done before. Related to these studies, it was revealed that among the R&D studies conducted by Indonesian researchers, critical thinking skills are still not equipped as a fundamental basis for developing their research.

Quantitative research if explained again, there are five methods in research used by researchers in research on environmental literacy as in Figure 3. Survey research is the most widely used in quantitative research. survey research is a research method used to collect data from a particular population. In survey research, researchers survey a sample of the population to study the characteristics or behavior of the population. the use of survey research in environmental literacy has advantages, namely Efficient, Large-scale, Objective. survey research related to environmental literacy can be used as a profile of a school, region or country to measure the level of environmental literacy. the results of survey research can be used as one of the references in determining learning methods, learning curriculum, and evaluation of the learning process.

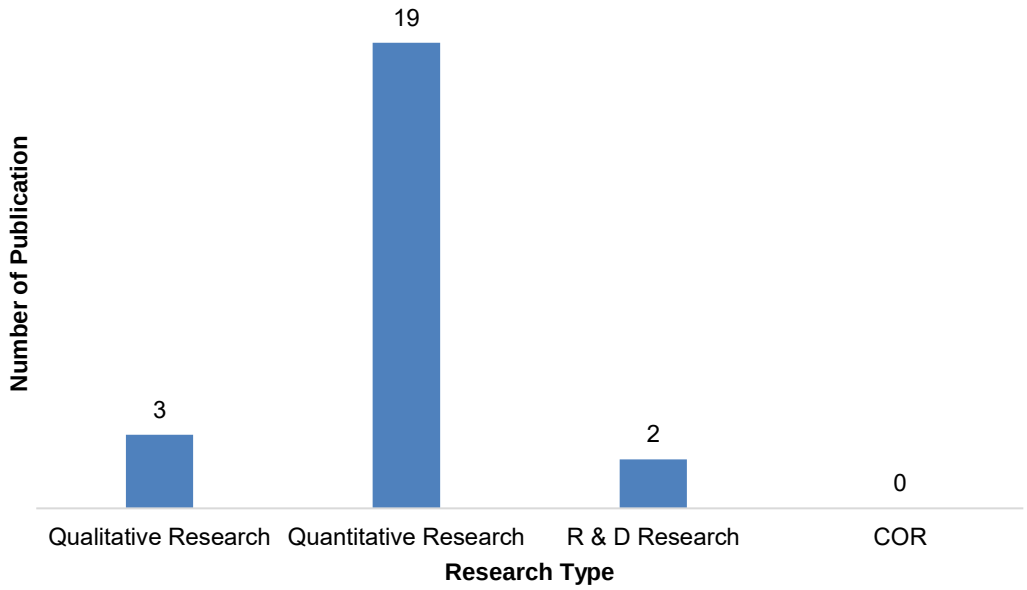

Figure 2. The distribution of researches with environment literacy as the main concern based on types of research

Experimental research can be considered effective in developing environmental literacy skills, so the environmental literacy research in this study is more action research. The environmental literacy of students can be improved by learning in the classroom using the problem-based learning model. This requires learning planning that includes the components of environmental literacy and the analysis of the learning model used, problem-based learning, so that learning works effectively, effectively and to achieve maximum results. Efforts to improve environmental literacy must be sustainable (Febriasari & Supriatna, 2017).

Research Subject

Based on Figure 4. shows that research related to environmental literacy mostly uses class x samples and is followed by class vii. this shows that environmental literacy research is based on schools. this is in line with the findings of Susetyarini and Fauzi (2020), which are related to analyzing the content of biology education. students as academics, namely one of the components of society, need to be involved in overcoming these problems. Therefore, students need to be equipped with knowledge, a sense of concern, and critical thinking, and have a deep understanding so that they can be applied to answer the issues of problems experienced today. These things can be obtained if applying science literacy. This is

one of the reasons researchers conduct research with student samples.
Although the potential for success of environmental literacy efforts at the elementary level remains high in school classrooms, several barriers associated with science teaching may hinder their inclusion (Stevenson et al., 2014). Many efforts have been made to increase environmental literacy, one of which is the Adiwiyata program (Anggraini et al., 2019), but the role of teachers needs to be increased in using learning tools, so that learning is more varied (Nurwidodo et al., 2020). Environmental literacy research is carried out involving junior high school research subjects, this is related to instilling environmental literacy in children from an early age. Students' knowledge and understanding of the environment must be provided early (Kamil et al., 2020).

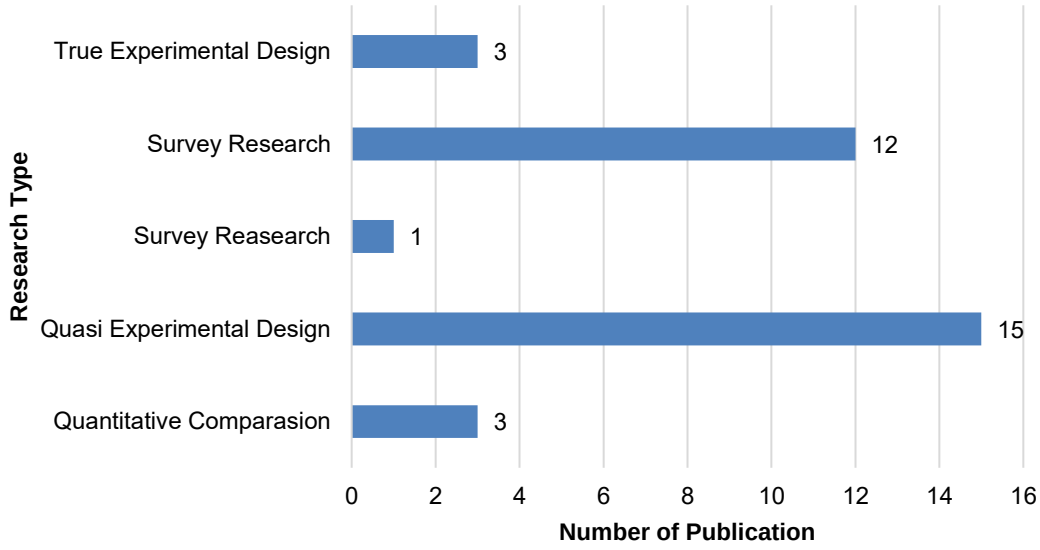

Figure 3. Types of quantitative research with concern in Environment Literacy

Based on the results of several studies, the implementation of environmental education in the classroom is still hampered and not optimal. The weakness of environmental education lies in the material and learning. The model applied in schools is inadequate and inappropriate so that students do not complete it understanding of environmental conservation. The appropriate action to overcome this weakness is to create a learning plan that suits the characteristics of the learning material (Wardani et al., 2018). Increasing environmental literacy among the public and prospective teachers needs to be done to be sensitive to the latest environmental issues (Dada et al., 2017). In order to create a society that cares about the environment, there needs to be collective environmental literacy (Ardoin et al., 2023).

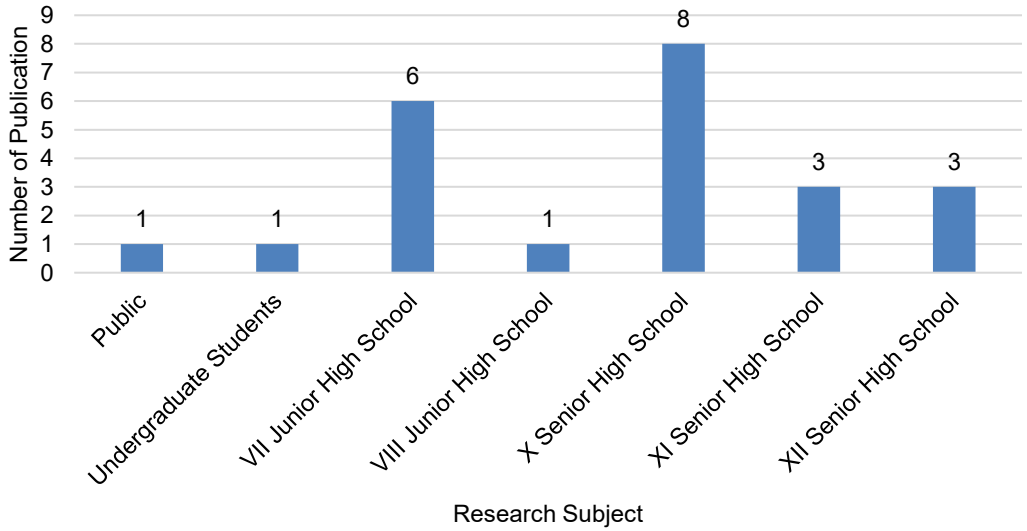

Figure 4. Research Subject in Article of Environment Literacy

Data Collection Instrument

The study used research instruments in collecting data from the sample. Instruments make research directed and effective in achieving the specified research objectives. Research instruments can be of various types, such as tests, observations, questionnaires, etc. In Figure 5. shows that the use of test instruments is the most among other instruments. the ability of environmental literacy is emphasized on making a decision and getting involved in social life based on the knowledge it has is no longer just on mastering the material and understanding the concepts and processes of science. this requires a test to measure how students process in developing their environmental literacy. The Environmental Literacy Framework shows A. Knowledge, B. Impact, C. Skills and D. Behavior and consists of 6 peopleComponent:1. Environmental knowledge 2. Verbal engagement 3. Real engagement4. Environmental sensitivity and environmental awareness5. Problem identification and analysis6. Planning activities.

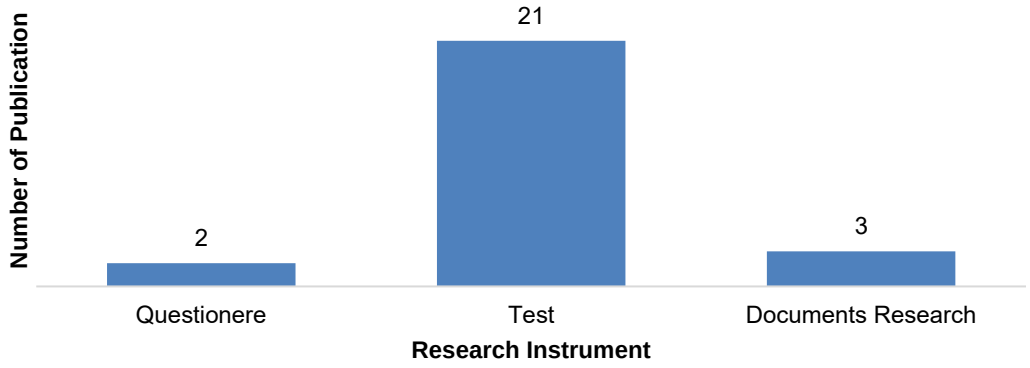

Figure 5. Data collection instrument of environment literacy article

There are several test instruments used in research related to environmental literacy, namely: North American Association for Environmental Education (NAAEE), Middle School Environmental Literacy Survey (MSELS), Environmental Literacy Assessment of Indonesian Students (ELAIS), and Program for International Student Assessment (PISA) (Figure 6). There are several articles that use instruments prepared independently. When preparing a test instrument, it is necessary to pay attention to the validity and reliability of an instrument. Some people who use tests as the main data collection technique do not inform whether the instrument has been tested for validity and reliability. The importance of validity and reliability of instruments must be tested before being used to collect data (Bajpai & Bajpai, 2014). In other words information regarding validity and reliability is considered important to convince target readers.

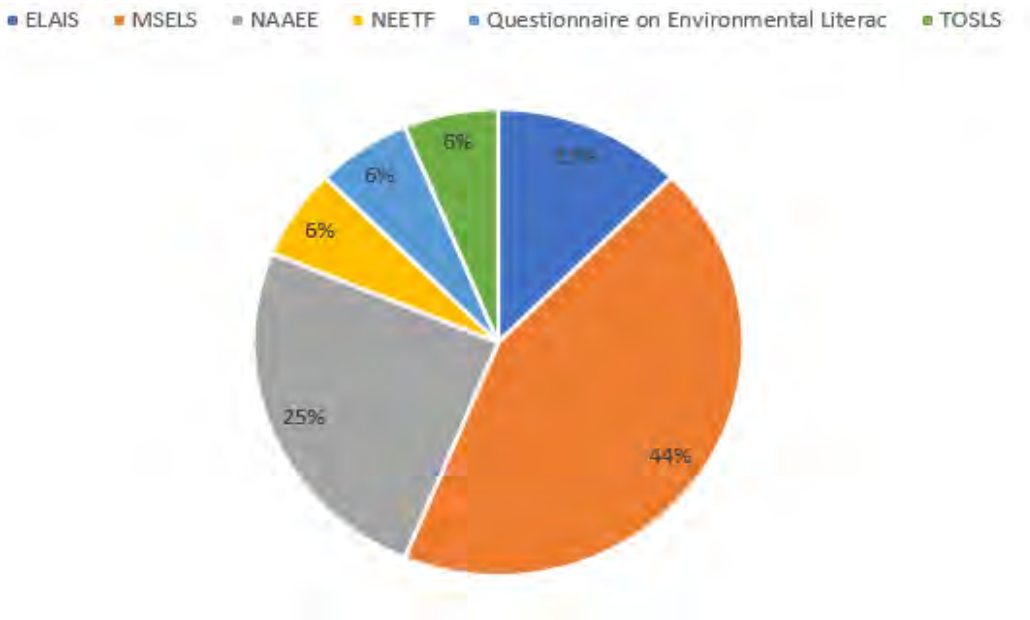

Figure 6. Percentage of data collection instrument

The Middle School Environmental Literacy Survey (MSELS) is an instrument designed to assess the environmental literacy of middle school students in grades 6-8. It was developed by a team of researchers at the University of Wisconsin-Madison and has been used in numerous studies around the world. The MSELS, a comprehensive and validated instrument, offers advantages such as ease of administration and scoring, providing a reliable measure of students' environmental literacy, and facilitating tracking of student progress over time. Additionally, it has been utilized in diverse research studies to evaluate the effectiveness of environmental education programs, identify factors impacting students' environmental literacy, and develop new assessments in this field.
Validity and reliability of questionnaires/surveys as significant research instruments tools reviewed. Different types of validity are discussed with the aim of increasing validity skills and knowledge of survey validity testing among researchers. As discussed, there are four main ones test the validity of the questionnaire, namely; face validity, content validity, construct validity and Criterion validity (Taherdoost, 2017).

Location Research

Research locations can be used as a benchmark to determine the development of research culture in an area. Figure 7 shows that research related to environmental literacy is still widely carried out on the island of Java, followed by the island of Sumatra. This shows that the research culture of Indonesia is still lacking. In fact, if we observe all the islands in Indonesia, only 4 islands have conducted research related to environmental literacy. This can be used as an evaluation and further research related to problems in developing environmental literacy. Environmental literacy is one of the efforts to preserve nature, and make humans have an attitude that cares about the development and condition of the surrounding environment.

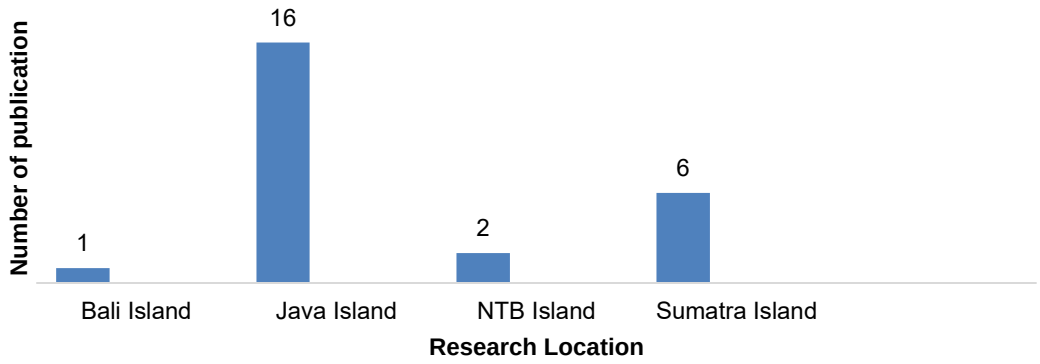

Figure 7. Research location in environment literacy topic in Indonesian Journal

In Indonesia there is no research on a national scale related to environmental literacy. This is an opportunity to see the profile of Indonesian students' environmental literacy abilities. Relevant research has been carried out in various countries such as Türkiye, Taiwan, Malaysia and the United States. Environmental literacy is one of the steps that can be used to carry out environmental conservation (Otto & Pensini, 2017). In articles published in science and biology education journals throughout Indonesia, environmental literacy experienced a positive trend by first appearing in 2017, and then 9 related articles were found. with environmental literacy in 2023. In carrying out research related to environmental literacy, it is still dominated by quantitative research models. This quantitative research is carried out with the aim of measuring the level of environmental literacy with instruments that have been prepared or validated by experts, thus showing that quantitative research provides results which is clear in the environmental literacy abilities of the research sample. This is shown by the number of research subjects used in research related to environmental literacy, 89% of which used school students, of which almost 90% used tests in using data collection instruments.
Developing environmental literacy is a big challenge for schools. It is the teacher's role in the environment and environmental education that really determines whether students are educated to become adults who take responsibility for protecting the environment and improving the quality of life (Swanepoel et al., 2002). Furthermore, 64% of research related to environmental literacy is still carried out on the island of Java, and the rest is spread across the island of Bali with 4% in Bali, 8% in NTB, and 24% on the island of Sumatra. This research, which is still Java centric, is influenced by several things, namely, imperfect facilities outside Java. Academics, experts and administrators need to be more serious about promoting environmental literacy and sustainable development education (Ozgurler & Cansaran, 2014).

Conclusion

In this research, the focus is on articles discussing environmental literacy in Indonesian journals indexed by SINTA. There are 24 articles discussing environmental literacy. positive trends were found in research related to environmental literacy. Among these articles, quantitative research is often found. The samples found in the article were mostly found in junior high schools. Apart from that, the data collection used was a test instrument. and most often use independently composed instruments. Research related to environmental literacy is still spread across the islands of Java, Sumatra, Bali and NTB. In light of the findings of this study, several recommendations have been made for further research. First, R & D research and qualitative research are important to examine in environmental literacy to investigate the development of environmental literacy skills. Second, researchers need to provide evidence of validity and reliability in compiling research instruments. Final, In Indonesia there is no research on a national scale related to environmental literacy. This is an opportunity to see the profile of Indonesian students' environmental literacy abilities.

Acknowledgment

Respectful appreciation be upon to environmental literacy researchers whose data can be used for content analysis.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Author Contributions

J. Awaludin: methodology, writing original draft preparation, and review and editing. **T. H. Kurniati:** methodology, writing original draft preparation, and review and editing. **R. H. Ristanto:** methodology, writing original draft preparation, and review and editing. **R. Komala:** methodology, writing original draft preparation, and review and editing.

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