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Research Article

Student's environmental literacy: An educational program reflections for a sustainable environment

I Made Surya Hermawan [a,1,*], Hadi Suwono [b,2], Anak Agung Inten Paraniti [a,3], Jittawisut Wimuttipanya [c,4]

[a] Department of Biology Education, Faculty of Teacher Training and Education, Universitas Mahasaraswati Denpasar, Jalan Kamboja No. 11A, Denpasar, Bali 80233, Indonesia

[b] Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Negeri Malang, Jalan Semarang No. 5, Malang, East Java 65145, Indonesia

[c] General Science Program, Faculty of Education, Bansomdejchaopraya Rajabhat University, Bangkok, 10600, Thailand

[1] surya.hermawan@unmas.ac.id*; [2] hadi.suwono.fmipa@um.ac.id, [3] intenparaniti@unmas.ac.id, [4] jittawisut21@gmail.com

* Corresponding author

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ABSTRACT

Learning that empowers students' environmental literacy needs to be encouraged considering the increasing environmental damage. This study aimed to reflect on educational programs on environmental sustainability by measuring the environmental literacy of high school students and identifying the relationship between environmental literacy domains. This correlational survey research involved 154 students taken by random sampling technique. Data analysis used descriptive statistics, Pearson product-moment correlation test, and multiple regression test. The results of data analysis showed: 1) environmental literacy of high school students was categorized as moderate; 2) the domain of knowledge and cognitive skills was high, while the domain of attitudes and behavior towards the environment was moderate; 3) the knowledge domain had a significant relationship with the cognitive skill, the attitude had a significant relationship with the behavioral domain, while there was no significant relationship between the knowledge domain and the attitude domain. The findings of this study indicated that the empowerment of environmental literacy through educational institutions was not yet optimal. Therefore, it is necessary to evaluate local and operational-based environmental education policies, such as integrating environmental literacy content with local culture in the learning process.

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INTRODUCTION

As the years go by, various natural phenomena due to environmental damage tend to increase, such as global warming (Al-Ghussain, 2019; Xu et al., 2018) to climate change (Guo et al., 2015). These natural changes have the potential to cause diseases that can lead to endemics to new pandemics (Wu et al., 2016). Global warming and climate change that occur due to human activities can cause a disease to become a pandemic because the transmission and mutation of a virus are influenced by environmental factors such as temperature, humidity, sunlight, and others (Acter et al., 2020; Priyadarsini & Suresh, 2020). In addition,

deforestation and land-use change also increase the opportunity for transmission of pathogenic viruses from animals to humans because these activities increase contact between humans and animals and damage the habitat of the original host of a virus (Arora & Mishra, 2020). Furthermore, environmental pollution also increases the chance of comorbidities and malnutrition which have an impact on the decline of the human immune system so that they become more easily infected with a disease (Madhav et al., 2017).

The balance between meeting the needs of human life and environmental sustainability should be a common goal to ensure the sustainability of life in the future as per the Sustainable Development Goals (SDGs) agenda. Environmental literacy is related to environmental knowledge, attitudes towards the environment, cognitive skills to solve environmental problems, and behaviors that support the environment (Hollweg et al., 2011). Environmental literacy is also one aspect that must be developed in education in the 21st century (Stehle & Peters-Burton, 2019). This development aims to enable students to respond to environmental changes globally so that they can contribute to the sustainability of human life and the environment. In this case, educational institutions have a responsibility to empower environmental literacy as a whole with unity between aspects of knowledge, attitudes, and behavior (Spinola, 2015) through environmental education (Goldman et al., 2013; McBride et al., 2013) to ensure the sustainability of life in the future. Therefore, the empowerment of environmental literacy in students must cover aspects of educational policy (Aminrad et al., 2013; Velempini, 2017).

In Indonesia, environmental education programs have been included in education policies. One of them is through the "Adiwiyata Program". Adiwiyata program aims to produce a generation that has environmentally friendly behavior where this goal is part of the environmental literacy criteria. The Adiwiyata School is a good and ideal school to gain knowledge, norms, and ethics to achieve a prosperous life and the ideals of sustainable development. The relevance of this program to empower environmental literacy has also been proven empirically. Astuti & Aminatun (2020) revealed that students who study at Adiwiyata schools have higher environmental literacy than students who do not study at Adiwiyata schools. This shows that the Adiwiyata program has a significant effect on increasing students' environmental literacy. However, in 2019, there were only 434 schools that won the award (Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia, 2019). This number is still relatively small because Indonesia has at least 500.000 schools (Kementerian Pendidikan dan Kebudayaan Republik Indonesia, 2021). The data presented shows that Indonesia still has big challenges to promote environmental education programs to empower environmental literacy. In addition, continuous evaluation of the implementation of environmental education policies also needs to be carried out so that in the future the number of Adiwiyata schools can increase significantly.

These challenges also appear factually through various environmental problems that occur in various regions in Indonesia. For example, environmental problems due to the development of the tourism industry in Bali. Bali, as it is known as one of the world's tourism destinations, gets economic benefits from the tourism sector. On the other hand, the existence of the tourism sector also harms the environment (Butarbutar & Soemarno, 2013; Egbali et al., 2011; Macleod, 2013; Sutawa, 2012) such as the conversion of agricultural land used to build tourism facilities (Sutawa, 2012), the clean water crisis in tourism center areas (Roth & Sedana, 2015), and environmental pollution (Wijaya, 2015). The description of environmental problems shows an imbalance in social and natural aspects of life in which economic progress is not balanced with natural stability.

The environmental problems that occur in Bali due to the progress of the tourism industry show that there is an imbalance of social and natural aspects in people's lives. People seem to tend to prioritize social aspects, which in this case is an economic improvement compared to natural aspects in the form of environmental sustainability. Various factors do influence the occurrence of this, one of which is education. This is because today's society is the outcome of the former and ongoing education system. Therefore, it is necessary to know the effectiveness of implementing an environmental education curriculum in schools.

One of the efforts that can be implemented to determine the effectiveness of the implementation of the environmental education curriculum in schools is to measure the level of students' environmental literacy. In recent years, many researchers from various countries have published their research findings on environmental literacy and environmental education. Some of them were conducted in Botswana (Velempini, 2017), Israel (Goldman et al., 2013; Levy et al., 2018), Malaysia (Aminrad et al., 2013; Fah & Sirisena, 2014), Turkey (Genc & Akilli, 2016; Saribas et al., 2014), Portugal (Spinola, 2015), Thailand (Longsiri et al., 2017), and Indonesia (Maknun et al., 2017; Maulidya et al., 2014). Those studies generally reveal varying results about the level of environmental literacy, the relationship between domains, and environmental education policies. However, although various research results have described the results of students' environmental

literacy and the relationship between its domains, it cannot be used as a fully valid basis in the context of Bali in particular. The reason, those previous studies have shown varying results. Moreover, students' literacy could be influenced by various social factors such as belief, culture, economy, and politics. Therefore, this study aimed to measure the environmental literacy of students in Bali and identify the relationship between the domains as an effort to reflect on environmental sustainability-based educational programs. The results of this study can then be used as a basis for evaluating the effectiveness of environmental education that has been taking place in educational institutions. Furthermore, the results of this study can also be the basis for formulating future environmental education policies that are local so that they are more relevant and follow the culture that develops in the community.

METHOD

This research was a cross-sectional survey study conducted from January until February 2021. The population of this research was all high school students in Denpasar City. Sampling was done by using a random sampling technique on the high school in Denpasar City. The use of random sampling was aimed so that the results can be a representation of the population. The number of samples in this study was 154 people taken from 4 schools in Denpasar City.

The research phase began with the randomization of schools and research samples. After obtaining the sample, data collection was carried out using the direct administration to a group technique. The research sample in each school used students in one class who were then given instruments directly to work on. Students' environmental literacy data were collected with the environmental literacy instrument adopted from the Environmental Literacy Assessment of Indonesian Students (ELAIS) developed by Rahmawati et al. (2017). The instrument consisted of 4 domains of environmental literacy including the domains of knowledge, attitudes, cognitive skills, and behavior. The instrument items consisted of 30 multiple choice questions for the knowledge domain (reliability: 0.650), 18 questionnaires for the attitude domain (reliability: 0.750), 20 multiple choice questions for the cognitive skills domain (reliability: 0.570), and 16 questionnaires for the behavioral domain (reliability: 0.780). The attitude domain questionnaire used a 4-scale Likert scale with perceptions of strongly agree, agree, disagree, and strongly disagree. Meanwhile, the behavioral domain questionnaire used a 4-scale Likert with frequency choices of always, often, rarely, and never. All instruments have a validity of 88% based on validity tests by experts and practitioners

The data that had been collected was then analyzed. Data analysis was performed using descriptive statistical techniques, Pearson product-moment correlation test, and multiple regression test. A descriptive statistical test, mean and standard deviation, was used to determine the environmental literacy level of high school students in Denpasar City. Categorization was done by converting the scores obtained by referring to the environmental literacy category by Maulidya et al. (2014). Category details are presented in Table 1. Pearson product-moment correlation test was used to determine the relationship between environmental literacy domains covering the domains of knowledge, attitudes, cognitive skills, and behavior. The test was then followed by a multiple regression test to determine the influence and contribution of each domain to environmental literacy. Data analysis used a significance level of 0.05.

Table 1. Category of environmental literacy

Domains	High	Moderate	Low
Knowledge & Cognitive Skills	41-60	21-40	0-20
Attitude & Behavior	45-60	28-44	12-27
Overall Environmental Literacy	169-240	97-168	24-96

Source: Maulidya et al. (2014)

RESULTS AND DISCUSSION

In general, the descriptive data analysis of environmental literacy scores is presented in Table 2. The overall environmental literacy score shows an average of 166.39 with a standard deviation of 16.97. The score is in the moderate category. Meanwhile, in each domain, the highest mean score was found in the attitude domain while the lowest mean score was found in the behavior domain. The domain of knowledge and cognitive skills is in the high category while the domain of attitudes and behavior shows the moderate category.

To determine the distribution of students' environmental literacy levels in each domain, a descriptive analysis was carried out to show the percentage. Figure 1 shows the distribution of students' environmental

literacy levels in each domain. In all domains, except for the cognitive skills domain, the majority of students are in the moderate category. It was also found that students who had low categories in the domains of knowledge, attitudes, and cognitive skills even though they were very few.

Table 2. Descriptive statistic of environmental literacy

Domains	*N*	Max. Score	*M*	*SD*	Category
Knowledge	154	60	40.40	6.60	High
Attitude	154	60	44.31	5.57	Moderate
Cognitive Skills	154	60	42.05	9.78	High
Behavior	154	60	39.62	4.55	Moderate
Overall Environmental Literacy	154	240	166.39	16.97	Moderate

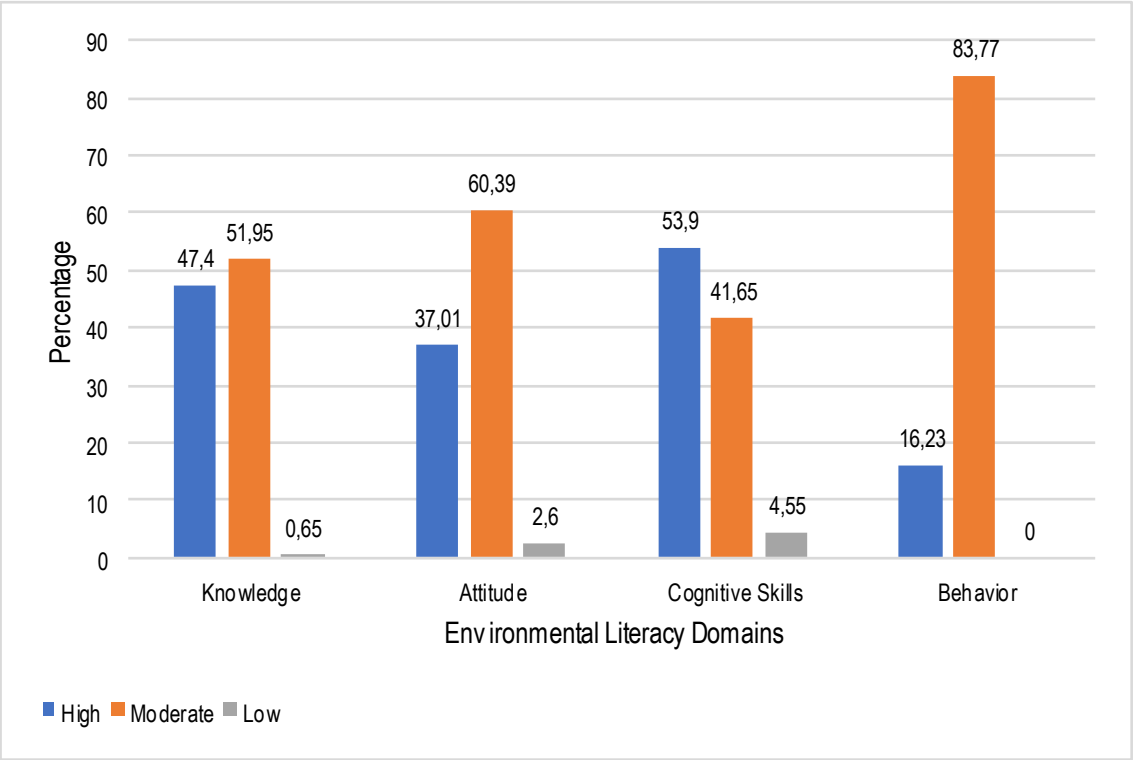

Figure 1. Distribution of environmental literacy categories in each domain

The next data analysis was carried out by using a correlation test to reveal the relationship between environmental literacy domains. Correlation analysis (Table 3) reveals that the knowledge domain has a significant relationship with the cognitive skills domain (r=0.37). This result indicates that cognitive skills are constructed by the knowledge received by a person so that they can apply their knowledge in real-life contexts. Furthermore, the attitude domain has a significant correlation with the behavior domain (r=0.51). This result is in line with previous research revealed by Fah & Sirisena (2014), Maulidya et al. (2014), and Genc & Akilli (2016).

Table 3. Correlation between environmental literacy domains

	K	A	CS	B
Knowledge	-	-	-	-
Attitude	0.05	-	-	-
Cognitive Skills	0.37**	0.01	-	-
Behavior	0.17*	0.51**	0.06	-
Environmental Literacy	0.66**	0.49**	0.74**	0.54**

Note: *(p<0.05); **(p<0.01); K=Knowledge; A=Attitude; CS=Cognitive Skills; B=Behavior

On the other hand, the results of data analysis show that there is no significant relationship between knowledge and attitudes towards the environment. Although behavior has a relationship with knowledge, the relationship is categorized as very weak compared to the relationship between behavior and attitudes which

shows a moderate relationship. These results are consistent with the findings of previous studies which revealed that there was no significant relationship between knowledge and attitudes towards the environment (Aminrad et al., 2013; Fah & Sirisena, 2014; Saribas et al., 2014). These findings further show that the knowledge gained by students at school does not contribute significantly to changes in environmental care attitudes. This attitude will then be reflected in environmental care behavior because they have a significant relationship.

Meanwhile, each domain has a significant relationship with overall environmental literacy. It was shown in the knowledge domain (r=0.66; strong); 2) attitude domain (r=0.49; moderate); 3) the domain of cognitive skills (r = 0.74; strong), and 4) behavior (r = 0.54; moderate). A positive r value indicates that each domain of environmental literacy has a positive relationship with overall environmental literacy. This reveals that the increase in each domain of environmental literacy will affect the increase in overall environmental literacy.

To determine the contribution of each environmental literacy domain to overall environmental literacy, the data analysis was continued by using multiple regression tests (Table 4). Based on Table 4, the value of p<0.05 indicates that each domain of environmental literacy can be used to simultaneously predict the level of overall environmental literacy. The details of the contribution given by each environmental literacy domain to overall environmental literacy were: 1) knowledge domain (12.0%); 2) attitude domain (7.9%); 3) cognitive skill domain (55.7%); and 4) behavioral domain (24.4%).

Table 4. Contribution domains to overall environmental literacy

Domain	Environmental Literacy		
	R^2	%	*p*
Knowledge	0.120	12.0	<0.001
Attitude	0.079	7.9	
Cognitive Skills	0.557	55.7	
Behavior	0.244	24.4	
Total	1	100	

The research findings show that the majority of students' environmental literacy levels are in the moderate category. The moderate category can be considered quite good but educational institutions have challenges to increase their role in empowering environmental literacy considering that there are gaps between environmental literacy domains. The high category in the domain of knowledge and cognitive skills was not matched by the same category in the other two domains. This can be a sign that the development of cognitive aspects is not in line with the affective and psychomotor aspects of students so that their knowledge has not been able to be seen optimally in daily attitudes and behavior.

The research findings show that the majority of students' environmental literacy levels are in the moderate category. The moderate category can be considered quite good but educational institutions have challenges to increase their role in empowering environmental literacy considering that there are gaps between environmental literacy domains. The high category in the domain of knowledge and cognitive skills was not matched by the same category in the other two domains. This can be a sign that the development of cognitive aspects is not in line with the affective and psychomotor aspects of students so that their knowledge has not been able to be seen optimally in daily attitudes and behavior.

Although the gap between these domains is not at an extreme distance, for example, high and low, it is not a guarantee of the school's success in empowering environmental literacy. That's because the four domains of environmental literacy must be empowered in an integrated manner between one domain and another (Spinola, 2015). After all, each domain has a positive contribution to improving overall environmental literacy.

The challenge for the education sector is also seen from the results of the analysis of the relationship between the knowledge domain and the attitude domain which does not show a significant correlation. The insignificant relationship between the knowledge and the attitude domain can also be caused by the social and cultural factors of students (Fah & Sirisena, 2014). In this case, it can be seen that the social and cultural systems that exist in the community have not been fully able to develop students' positive attitudes towards the environment. This phenomenon occurs because of the shift in social and cultural values of the community towards the environment due to the influence of tourism, globalization, and industrialization. Similar arguments were also presented by several research reports which stated that the social and cultural values of a society can change due to tourism developments (Zhuang et al., 2019) and globalization (Ugbam et al.,

2014). The shift in social and cultural values is also a challenge for educational institutions because one of the functions of educational institutions is as a place of cultural transmission.

The findings of this study are not in line with empowering environmental literacy which expects students to reach the operational category. The operational category means that environmental literacy is not just knowledge or cognitive skills, but must also be seen in operational attitudes and behavior. Therefore, it is necessary to increase environmental literacy through various means including educational policies to ensure the sustainability of life in the future.

For students to reach the operational category of environmental literacy, education authorities should evaluate the implementation of the educational curriculum. Evaluation can be done by reviewing the details of program implementation in the field and making improvements to the aspects that are needed, especially. One evaluation that can be done is to ensure that the program is not based on instant results, but on an operational and continuous learning process. This can be done by integrating the content of environmental education, or in this case environmental literacy, which is contained in the Adiwiyata program into relevant learning content. This integration aims so that the environmental education is not impressed as a separate content but becomes a single unit in the learning process so that its empowerment can take place more massively. For example, integration can be done in biology subjects in several materials such as biodiversity and ecology.

Furthermore, the authorities can provide flexibility to schools and teachers to implement environmental education policies in a more technical and local. The teacher can adjust the learning process including the learning approach, models, methods, and others that need to be adapted to the circumstances of the local community. Students' environmental literacy is influenced by various complex factors and is largely determined by the state of society. Some of the factors include economic status (Levy et al., 2018), family factors (Aminrad et al., 2013), social norms (Fah & Sirisena, 2014), culture factors (Ilhami, 2019), and gender (Levy et al., 2018) which cannot be generalized from one place to another.

For example, a local approach in the Balinese context can be done by formulating learning content that is relevant to environmental literacy based on the *Tri Hita Karana* culture. *Tri Hita Karana* is the three causes of human happiness consisting of *parhyangan*, *pawongan*, and *palemahan* (Sukarma, 2016) where this value has been universally known by all Balinese people. *Parhyangan* means a harmonious relationship with God, *pawongan* means a harmonious social relationship between humans, and *palemahan* means a harmonious relationship with nature (Sukarma, 2016). The three components of *Tri Hita Karana* are closely related to environmental literacy because they contain social (*pawongan*) and natural (*palemahan*) aspects as the principles of environmental literacy. In addition, the social and natural aspects of the life of the Balinese and Indonesian people, in general, cannot be separated from the religious aspect (*parhyangan*). A local approach will lead to contextual learning that is believed to increase knowledge (Ardan, 2016) and students' skills to solve environmental problems (Dewi et al., 2017) which are in line with the principles of environmental literacy.

This pattern is seen as making environmental literacy a part of the culture of everyday life so that it becomes an integral part of students' lives. In other regions of Indonesia, it is believed that there are cultural values that are similar and relevant to the context of environmental literacy. Therefore, it takes a strong commitment from policymakers and education practitioners to formulate and internalize local cultural values that are relevant to the concept of environmental literacy. The formulation and internalization are then packaged in educational operations in terms of approaches, models, methods, or other learning instruments. Therefore, further studies are needed on the exploration of local culture that can be integrated into the learning process, including technical implementation, as the basis for making environmental education policies in the future.

CONCLUSION

The environmental literacy of students in Denpasar City is generally categorized as moderate. In detail, the domain of knowledge and cognitive skills was found to be in the high category while the behavior domain was in the moderate category. In the correlation analysis between domains, the domain of knowledge and cognitive skills showed a significant relationship, as well as the domains of attitudes and behavior. On the other hand, there is an anomaly where there is no significant relationship between the knowledge and attitude domains. The findings of this study reveal that local educational policy innovations are needed to harmonize the improvement of environmental literacy in each domain. Because it is not enough to empower environmental

literacy only on the cognitive aspect, but also on the affective and psychomotor aspects. Thus, students can apply their knowledge to attitudes and behaviors to ensure environmental sustainability in the future.

Local policies are needed because the level of environmental literacy is influenced by different social and cultural factors between regions. One that can be used is to integrate culture or local wisdom that exists in the community into the operational learning process. Cultural values and local wisdom that are relevant to environmental literacy can be contained in approaches, models, or learning methods so that the learning process is following the local environment. Therefore, further studies are needed regarding the exploration of local culture that can be integrated into the learning process, including technical implementation, as the basis for making environmental education policies to empower environmental literacy more massively.

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