INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 12, Issue 1, (2023) E-ISSN: 2226-6348

The Relationship of School Students' Environmental Knowledge, Attitude, Behavior, and Awareness toward the Environment: A Systematic Review

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To Link this Article: http://dx.doi.org/10.6007/IJARPED/v12-i1/15707 DOI:10.6007/IJARPED/v12-i1/15707

Published Online: 12 January 2023

Abstract

The quality of the environment is thought to have deteriorated at an alarming rate. Hence environmental education and awareness become critical steps to mitigate the issue. The current paper attempts to undertake a Systematic Literature Review (SLR) that focuses on the student's knowledge, attitude, awareness, and behavior toward the environment to identify the relationship among these variables as well as the methods for improving the environment. The PRISMA Statement (Preferred Reporting Items for Systematic reviews and Meta-Analyses) is used in the review process. A total of eleven articles that meet the inclusion and exclusion criteria were collected from three databases: Scopus, Web of Science, and ProQuest. Seven studies examined the relationship among four domains (environmental knowledge, attitude, awareness, and behavior). Two studies found discussed the relationship between environmental knowledge and environmental attitude. While one study only focused on environmental knowledge. Only two publications uncover how important it is to include environmental education in the learning process if we want to make a society that is aware of and cares about the environment. Also, several alternatives could be used to help students learn about the environment, such as outdoor environmental education and teaching materials based on local wisdom.

Keywords: Environmental Knowledge, Attitude, Awareness, Behavior, School Student

Introduction

Our planet is burdened by several environmental challenges that must be addressed individually, requiring individuals to cultivate attitudes and awareness that will steer them toward ecologically friendly behavior (Al-Rabaani & Al-Mekhklafi, 2009). The global environment has been revealed to have undergone significant changes in the last several decades, which were mainly attributed to human actions. The quality of the environment is

thought to have deteriorated at an alarming rate due to decreased air, water, and soil quality, increased ocean pollution, wildlife extinction, loss of biodiversity, and an increase in the frequency and intensity of catastrophic natural disasters (Abbas & Singh, 2012). Past studies claimed that human is entirely accountable for the damage and overexploitation of the environment and natural resources caused by greediness. Therefore, environmental education and awareness become critical necessary steps to mitigate the issue to a greater level.

Future generations must be provided with resources and environmental information to raise ecologically literate citizens. However, the amount of learning applicable to increase pupils' environmental literacy is still less than ideal (Liu et al., 2015). Lack of learning focused on environmental literacy is further attributed to limited understanding that can empower the literacy of pupils and the general population. Education can be used to influence people's environmental behavior. Environmental attitudes of the young generation are critical since they will eventually be impacted by and responsible for environmental problems caused by current behaviors (Cotton et al., 2007; Michalos et al., 2012; Pauw et al., 2015)

One of the most effective approaches to creating an environmentally friendly society is establishing a society with constant environmental awareness and effect. There is an essential mission for the school community, particularly students, in constructing culture. The students will provide direction to the community regarding youth generation education by playing the primary position. The formation and change of attitude are closely linked. Individuals constantly acquire, adjust, and abandon attitudes to meet their ever-changing needs and interests. Acceptance of a new perspective depends on who presents the knowledge, how knowledge is conveyed, how a person is viewed, the communicator's trustworthiness, and the circumstances under which the knowledge was acquired.

People can transform their attitudes, but changing their behaviors and practices is complicated and is dependent on various social and psychological factors. The practical application of rewards and reinforcements enhances the likelihood that the recognized individual will repeat the desired attitude and may encourage others to acquire the attitude.

Despite the abundance of literature on students' knowledge, awareness, attitude, and behavior toward the environment, little effort has been made to analyze the topics systematically, associate trends, and propose possible motives for the issue. The review processes, including identification, screening, and eligibility, have not been effectively handled. Traditional literature reviews are common and associated with issues of inclusivity and prejudice. Some of the researchers will select articles favoring their topic of interest (Mohamed et al., 2018). As a result, future scholars would face a significant challenge in replicating the study, validating the explications, as well as examining the extensiveness of the research under such a system. The SLR studies have several advantages, including collecting, evaluating, and synthesizing data from multiple studies, reducing bias, identifying trends or sources of heterogeneity in the results, and providing the possibility of extrapolating the results (Salas-Zapata et al., 2017).

Given this vacuum in the publications, the present paper attempts to undertake an SLR that focuses on the student's knowledge, attitude, awareness, and behavior toward the environment and proposes a possible move toward improving the environment. The authors were guided in their work by the critical study questions as follows:

- What is the relationship among students' environmental knowledge, environmental attitudes, environmental awareness, and environmental behavior?
- What are the possible methods to improve the environment?

Method

Review methodology—PRISMA

The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Statement guided the review. PRISMA included a checklist of 27 items recommended for reporting in systematic reviews, an "explanation, and elaboration" article with more reporting instructions for each item and writing examples. The guidelines have received widespread support and acceptance, as indicated by the co-publication in numerous publications and citations in over 60000 papers (Scopus, 2020), endorsement from almost 200 journals and systematic review organizations, and adoption in various disciplines. Evidence from observational studies suggests that PRISMA is associated with the complete reporting of systematic reviews (Page et al., 2021). Guided by PRISMA, the PICo approach was used to formulate the research questions when the SLR process got underway. The letters "P," "I," and "Co" stand for the problem or population, interest, and context, respectively. Next, a systematic approach to document searching was devised and implemented: identification, screening, and eligibility. Finally, data extraction and analysis were performed on the selected papers. The main research question led to the data extraction method, and the gathered data was then evaluated using qualitative data synthesis (thematic synthesis). Furthermore, to ensure the review's goal was reached, the authors followed the review's recommendations by examining alternatives.

Formulation of the research question

Two sources were employed in generating the research question; first, ideas from prior researchers, such as those by (Alagoz Akman, 2016; Kencanasari et al., 2019; Nowotny et al., 2018). All the articles related to how and why communities or students must have proper knowledge, attitude, awareness, and behavior toward their environment. Second, implementing the PICo approach (Lockwood et al., 2015). Based on these concepts, The investigators covered three primary elements in the analysis, the school society or students (Population), knowledge, attitude, awareness, and behavior toward the environment (Interest & Context). The PICo concept enabled the authors to formulate this study's central research question:

- what is the relationship between environmental knowledge, environmental attitudes, environmental awareness, and environmental behavior toward the environment?
- what are the methods for improving the environment?”.

Systematic Searching Strategies

To conduct an SLR that was both well-organized and transparent, the authors used the following procedures to locate and synthesize all relevant papers. Mohamed et al.,(2018) suggested three systematic methods for identifying, screening, and determining eligibility that was used to locate the relevant publications.

Identification

Four main keywords were identified based on the research questions: student knowledge, attitude, awareness, and behavior toward the environment. To broaden the scope of these keywords, the studies refer to the keywords used in prior research to find equivalents and related ones. Several keywords similar to student environmental knowledge, attitude, environmental awareness, and behavior were checked based on this process. These keyword combinations were analyzed utilizing search methods including key code functions,

term scanning, and Boolean operators in three databases: ProQuest "(Environmental knowledge) AND (environmental attitude) AND (environmental awareness) AND (environmental behavior)", Scopus "(TITLE-ABS-KEY (environmental AND knowledge) AND TITLE-ABS-KEY (environmental AND attitude) AND TITLE-ABS-KEY (environmental AND awareness) AND TITLE-ABS-KEY (environmental AND behavior))", and Web of Science "environmental knowledge (All Fields) and environmental attitude (All Fields) and environmental awareness (All Fields), and environmental behavior (All Fields)". Through the use of the chosen databases, 1937 relevant documents were discovered.

Screening

The following step was screening, whereby the papers were either included or removed from the study based on four common inclusion criteria: a) document's timeline, b) document type, c) language, and d) subject area. Addressing the 'research field maturity' conception stressed by Kraus et al (2020), it is crucial to reconcile the number of papers to the SLR's objective. Therefore, this review restricted the screening process to papers published between 2017 and 2021. This timeframe was selected since enough research was published to comprehensively analyze. Based on the document type, the selected paper is an article, and a conference paper written in English got reviewed to minimize mix-up. In addition, only papers emphasizing environmental knowledge, environmental attitude, environmental behavior, and environmental awareness were included in the selection. The screening proses is demonstrated in Figure 1.

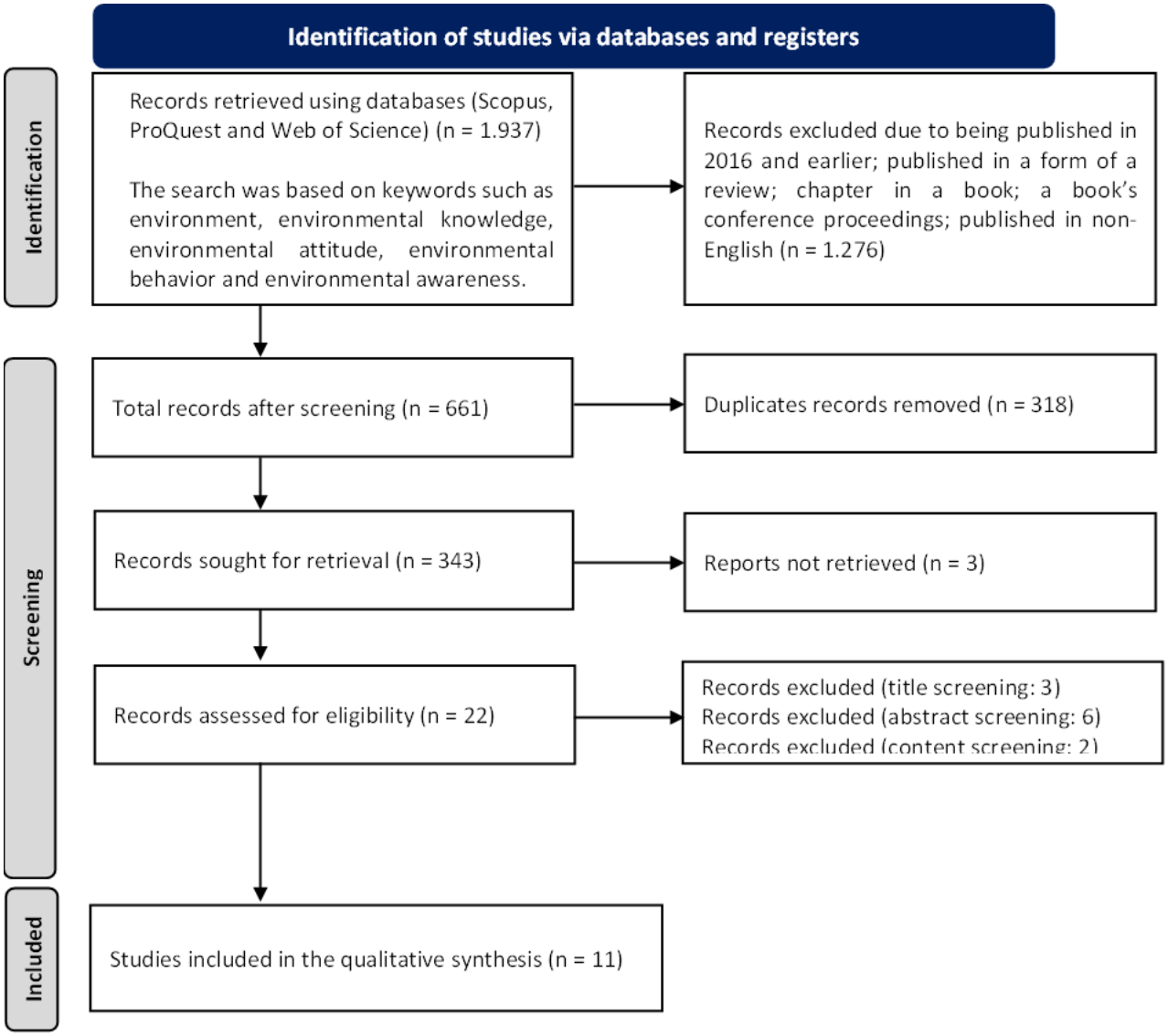

Figure 1. Flow diagram of the screening process

Eligibility

The rest of the papers were identified independently by the writers. Six hundred thirty-nine articles were removed since they did not focus on student environmental knowledge, attitude, awareness, and behavior in a review of the literature and were not scientifically grounded. Twenty-two articles were assessed for eligibility (Figure 1). As a result, there was a total of eleven articles approved for review.

Data extraction and analyses

Whittemore and Knafl (2005) argued that the excellent approach to combine or analyze integrative data is to use qualitative or mixed-method techniques that let the researcher repeatedly compare the primary data sources. The qualitative method was used in this review. The investigators carefully read each of the 11 publications, paying particular attention to the abstracts, results, and discussion sections. The research questions guided the data abstraction. It indicates that any data from the examined papers that address the research questions have been extracted and compiled into a table. The researcher then conducted a thematic analysis to identify themes and sub-themes based on efforts related to

perceiving patterns and themes, clustering, numbering, noting similarities, and linkages within the abstracted data (Braun & Clarke, 2019). It is generally agreed that thematic analysis is the most effective method for synthesis when dealing with a mixed research design (integrative) (Noyes et al., 2019). It is a descriptive strategy for reducing data in a flexible model that can be combined with other data analysis techniques (Vaismoradi et al., 2013).

Results

This section features the findings and analyze the information obtained. The findings of this study include the background of the selected articles and the themes underscored in the reviews. Next, the findings of each publication are discussed.

Background of the selected studies

From a total of 11 articles, there are two articles that focused their studies in Malaysia (Arshad et al., 2020; Makhtar et al., 2021) two in Indonesia (Adriyanto et al., 2021; Anggraini & Karyanto, 2018), and one each in Sri Lanka (Kuruppuarachchi et al., 2021), South Korea (Choe et al., 2019), Thailand (Janmaimool & Khajohnmanee, 2019), China (Gao, 2018), Cyprus (Asilsoy et al., 2017), Portugal (Paço & Lavrador, 2017) and the UAE (Hammami et al., 2017).

With regard to the period of the journals, three papers were published in 2017 (Asilsoy et al., 2017; Hammami et al., 2017; Paço & Lavrador, 2017), three in 2021 (Adriyanto et al., 2021; Kuruppuarachchi et al., 2021; Makhtar et al., 2021), two in 2018 (Anggraini & Karyanto, 2018; Gao, 2018), and another two in 2019 (Choe et al., 2019; Janmaimool & Khajohnmanee, 2019). There was also an article published in 2020 (Arshad et al., 2020).

It was recorded that seven studies utilized a quantitative analysis with various instruments including questionnaires, online surveys, usability tests, and surveys. Meanwhile, three studies employed qualitative analysis with multiple instruments, including interviews and surveys and one study used Mix-Method. The overall summary of the selected papers is demonstrated in Table 1.

Table 1
Overview of The Selected Papers

No	Authors	Year	Age Group	Journal	Focus Region	Method	Instrument
1.	Paço & Lavrador	2017	NA	Journal of Environmental Management	Portugal	Quantitative	Questionnaire
2.	Asilsoy et al	2017	16-25	International Journal of Educational Sciences	Cyprus	Qualitative	Questionnaire
3	Arshad et al	2020	NA	Polish Journal of Environmental Studies	Malaysia	Quantitative	Questionnaire
4	Kuruppuarachchi et al	2021	NA	Sustainability	Sri Lanka	Quantitative	Questionnaire
5	Kim et al	2019	14-16	International Research in Geographical and Environmental Education	South Korea	Quantitative	Questionnaire
6	Mohammed et al.	2017	13-15	Environmental Science and Pollution Research	UAE	Quantitative	Questionnaire
7	Janmaimool and Khajohnmanee	2019	NA	Sustainability	Thailand	Quantitative	Questionnaire
8	Makhtar et al	2021	20-25	IOP Conference Series: Earth and Environmental Science	Malaysia	Qualitative	Survey
9	Anggraini et al	2018	13-15	International Conference on Teacher Training and Education	Indonesia	Mixed-Method	Questionnaire and interview
10	Gao et al	2018	20-25	Ekoloji	China	Quantitative	Test
11	Adriyanto et al.	2021	16-18	IOP Conference Series: Earth and Environmental Science	Indonesia	Qualitative	Survey

Discussions

The relationship among environmental knowledge, environmental attitudes, environmental awareness, and environmental behavior toward the environment

The total number of papers that met the criteria for acceptance is eleven. In general, analysis on all obtained articles can be categorised based on the following criteria: (a) discussion on the relationship of each domain (environmental knowledge, environmental attitude, environmental awareness, and environmental behavior) became the focus in seven studies (Adriyanto et al., 2021; Arshad et al., 2020; Gao, 2018; Hammami et al., 2017; Janmaimool & Khajohnmanee, 2019; Paço & Lavrador, 2017), (b) examination of environmental knowledge and environmental attitude detailed out in two studies (Anggraini & Karyanto, 2018; Choe et al., 2019), and (c) only environmental knowledge topic reviewed in two other studies (Asilsoy et al., 2017; Kuruppuarachchi et al., 2021).

Seven studies discuss the relationship between domains in more detail (see Table 2). The study by Paço and Lavrador (2017) found that environmental knowledge and attitude have a low correlation between environmental attitude and environmental behavior. In similar vein, Adriyanto et al (2021) discovered a weak correlation between environmental knowledge and environmental attitude. However, in contrast to the two previous studies, the results of three studies conducted by Janmaimool and Khajohnmanee (2019); Hammami et al (2017); Gao (2018) revealed positive correlations between environmental knowledge, environmental attitude, and environmental behavior. More specifically, Janmaimool and Khajohnmanee (2019) claimed that environmental knowledge has a significant role in students' attitudes and pro-environmental behavior. In an earlier study, Hammami et al (2017) also found that environmental knowledge positively influences students' pro-environmental behavior. Meanwhile, a study conducted by Gao (2018) which discusses the relationship between environmental attitude and environmental behavior states that environmental attitude has a positive effect on environmental behavior.

There were two studies that tapped into environmental awareness, focusing on students' knowledge, attitude, and behavior toward their environment (Makhtar et al., 2021; Arshad et al., 2020). The study by Makhtar et al (2021) revealed positive correlation between environmental knowledge and awareness. This result proves and strengthened studies conducted by Aminrad et al (2013); Guven and Slun (2017) which explains a significant correlation between knowledge and awareness of environmental issues. Meanwhile, the study by Arshad et al (2020) disclosed two interesting results: (a) there is no correlation between environmental attitude and environmental awareness, and (b) there is a correlation between environmental behavior and environmental awareness. Based on Safari et al (2018), knowledge and awareness of the environment significantly influence environmental behavior. Also, environmental knowledge and awareness indirectly influence environmental attitudes and green commitment (Safari et al., 2018). This is per the Theory of Planned Behavior by Ajzen (1991) that environmental knowledge is considered to be the precursor of attitude and influences the development of environmental behavior. The difference in the study results is caused by differences in the characteristics of participants as objects of research and differences in the research area, which certainly affect the variation in the study results.

Table 2
The Themes and The Sub-Themes

No	Authors	Focus Region	Themes	Sub-Themes	Findings
1.	Paço & Lavrador (2017)	Portugal	Environmental knowledge, attitude, and behavior	Energy issues	The results indicated that there was no correlation between knowledge and attitudes or between knowledge and behavior, whereas the correlation between attitudes and behavior was found weak.
2.	Asilsoy et al (2017)	Cyprus	Environmental knowledge and environmental awareness	Biodiversity, nature conservation, global warming, and climate change.	Environmental knowledge and awareness are at a poor level, with more than 54% of respondents unable to answer accurately on global warming and ozone depletion. The findings have implications for the importance of environmental education to increase students' environmental consciousness.
3	Arshad et al (2020)	Malaysia	Environmental awareness, environmental attitude, environmental behavior	Global warming, air pollution, ozone depletion	Notably high levels of environmental awareness and environmental behavior were identified among students, while levels of environmental attitude were significantly low. Significantly positive impacts of environmental awareness and environmental concern on environmental behavior were discovered, while the influence of environmental attitude was shown to be significantly negative.
4	Kuruppuarachchi et al (2021)	Srilanka	Environmental awareness	Ozone layer depletion,	There was no significant difference between the two groups of students' environmental knowledge ($p > 0.05$). The environmental attitude and behavior of both student groups were relatively positive. This study

					emphasizes the significance of educating students about environmental challenges, particularly global and local issues, to better sustainable environment management.
5	Choe (2019)	South Korea	Environmental knowledge and attitude	Greenhouse effect, acid rains, water resources depletion, garbage pollution, air pollution, and wildlife reduction	The participants' environmental knowledge was weak, but their attitudes were fairly positive. The students' environmental knowledge and attitudes were shown to have a significant correlation, but it was only a moderate correlation (r =.302, p .01).
6	Hammami et al (2017)	UAE	Environmental knowledge and environmental attitude	Plastic pollution	The mean knowledge score of the students was 53%, with females (P 0.01), students in grades 11 and 12 (P = 0.024), and those whose parents had a higher level of education (P = 0.014) being more knowledgeable and oriented toward pro-environmental behaviors.
7	Janmaimool & Khajohnmanee (2019)	Thailand	Environmental knowledge, attitude, and environmental behavior	Political ecology, sustainable development, environment, and ecology	Only knowledge of the environment and ecology is considerably correlated with environmental attitudes, whereas diverse environmental knowledge is significantly correlated with pro-environmental behavior.
8	Makhtar et al (2021)	Malaysia	Environmental knowledge, awareness, and behavior	Environmental degradation	The value of environmental awareness and knowledge is high, indicating that pupils have a high level of environmental knowledge and awareness. In addition, a high level of knowledge affects student awareness of the environment.
9	Anggraini (2018)	Indonesia	Environmental knowledge	Ozone depletion,	The descriptive analysis revealed that the

			and awareness	ecosystem resilience, nutrient cycling	participants had a low level of ecological knowledge and a moderate level of ecological attitude. The low levels of students' knowledge and attitudes may be influenced by contextual teaching and learning processes.
10	Gao (2018)	China	Environmental attitude and environmental behavior	air, water, and soil pollution, radioactive waste, and the flood of other toxic substances	The relationships between environmental attitude and environmental behavior are statistically significant.
11	Adriyanto et al (2021)	Indonesia	Environmental knowledge, attitude, awareness, and behavior	NA	The acquired results indicate that the level of environmental knowledge and attitude among students is moderate, however, their environmental behavior is observed to be pretty good. The association between the three variables is moderately poor.

The methods on improving the environment

The second aim of this study is regarding the method on how to improve environmental consciousness. There are two articles that highlight the significance of environmental education in creating an environmentally conscious society (Asilsoy et al., 2017; Kuruppuarachchi et al., 2021). Environmental education focuses on helping people learn about the environment and develop attitudes and values that are good for the environment. Furthermore, it also helps people get the citizenship skills and higher-order cognitive skills they need to live in a way that is good for the environment (Parra et al., 2020). Both formal education and non-formal education play a crucial role in creating an environmentally conscious society. Through active learning pedagogies such as fieldwork and outdoor activities, formal education aims to construct scientific knowledge and cultivate students' relationships with nature. However, people's habits and routines are often the focus of non-formal environmental education initiatives like awareness drives and knowledge-sharing initiatives.

Gilford and Nillson (2014) classify two fundamental factors influencing a person's views, attitudes, and behavior toward the environment: personal and social. Early experience is the first component of the personal factor. A study conducted on children in Canada showed that children who study and discuss environmental issues at home and watch or read things related to environmental issues tend to have greater attention to the environment (Eagles & Demare, 1999). The second component of personal factors is individual knowledge and

education. Someone will find it difficult to act if they do not know and do not understand the environmental problems. Lastly, a sense of responsibility. Feelings of responsibility are a fundamental and essential part of environmental care (Kaiser et al., 1999).

On the other hand, social factors are also known as fundamental factors influencing individual views, attitudes, and behavior toward the environment. The first component of social factors is social strata. Citizens from developing countries tend to be more concerned about environmental problems than those living in more developed countries, which can happen because developed countries have fewer environmental problems (Brechin, 1999). The second component is cultural and ethnic variations. This factor contrasts with the social strata factor. Citizens living in developing countries seem to care for the environment more than those living in developed countries (Mostafa, 2011). Moreover, social norms are the third component of social factors. A study in Australia states that a person's motivation to do things that harm the environment is strongly influenced by prevailing social norms (McDonald et al., 2013)

Even though it takes a long time and that the results are not instantaneously apparent, teaching students to be responsible for nature is a good way to solve environmental problems (Reif, 2015). There are several suggestions on how to improve students' level of awareness, attitude, and behavior toward the environment through education such as outdoor learning and the use of teaching materials based on local wisdom. Outdoor environmental education-based learning is beneficial and has an impact on students' environmental attitudes and awareness (Amini, 2015; Sellmann & Bogner, 2013). However, the second suggestion is the implementation of teaching materials based on local wisdom. According to Ardan (2016), the use of instructional materials based on local wisdom has been shown to have a substantial influence on enhancing students' environmental knowledge and attitudes. Moreover, the implementation of an intensive system, rewarding good behavior, and punishing bad behavior are all important factors in the success of environmental education in schools (Thompson et al., 2014). This condition will encourage learners to have their internal reinforcement and punishment that lead to better environmental behavior (Pell & Jarvis, 2003).

Conclusion

The study reviews the papers that are focused on the relationship between students' environmental knowledge, attitude, behavior, and awareness toward the environment as well as to figure out the methods of environmental improvement. Only seven of the eleven publications analyzed gave a review of the relationship between the four variables, and no article reviewed the relationship between the four variables in a single study. Then, to create a society that is conscious and cares about the environment, only two publications stress the significance of embedding environmental education in the learning process. Moreover, alternatives that might be applied to promote students' environmental literacy include outdoor environmental education-based learning and teaching materials based on local wisdom.

Theoretical and Contextual Contribution

The significance of this paper is based on its contributions to the existing body of literature. This paper makes a significant contribution by providing a comprehensive view of the relationship among students' environmental knowledge, environmental attitude, environmental awareness, and environmental behavior. It also contributes to the body of

knowledge by focusing attention on how to improve the environment and identifying the factors that influence people's perspectives, attitudes, and behavior toward the environment. This paper has also contributed to the existing body of literature by including environmental awareness as a variable to be studied, whereas the majority of previous studies have focused solely on environmental knowledge, attitude, and behavior. Aside from empirical contributions, this paper has made theoretical contributions by reviewing why environmental knowledge influences environmental attitude and behavior per The Theory of Planned Behavior.

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