# Multidimensional Analysis of Environmental Literacy (Sensitivity, Knowledge, Belief, and Behavior of Environment) of Prospective Teachers

**Samsun Hadi, Abdulkadir Rahardjanto\*, Moch. Agus Krisno Budiyanto, H. Husamah**

Biology Education Department, Faculty of Teacher Training and Education, Universitas Muhammadiyah Malang. Jl. Raya Tlogomas 246 Malang 65144, Indonesia

\*Corresponding Author e-mail: abdkadir@umm.ac.id

**Abstract**

Sensitivity, knowledge, belief, and behavior to the environment will bring out good behavior that leads to environmental literacy (EL). This study aimed at analyzing the students' EL based on the multidimensional perspective. This study comprised of two types, namely library and field research. Questionnaire was developed from The Second Minnesota Report Card on EL. This study was conducted in FKIP-UMM at undergraduate level, from July to October 2020. The types of data were in the form of qualitative and quantitative. The data were obtained from the results of Google Form. The population of this study was the students of FKIP-UMM, in which it consisted of 2.750 students. The subjects were chosen randomly by sharing the link of Google Form thru the WhatsApp group so that 139 students (5%) were obtained. The data and EL findings were analyzed descriptively qualitative analytic. Scaling multidimensional analysis was carried out by using ordination that continued with scaling and percentage processes. The results indicated that (1) Environmental sensitivity tends to show various conditions. (2) Environmental knowledge also tends to vary. (3) Environmental beliefs tend to be good. (4) Environmental behavior in students tends to be good.

**Keywords:** multidimensional analysis; environmental literacy; prospective teachers

## INTRODUCTION

Lexically, literacy is defined as literate (Ajewole, 2012). However, literacy has a deeper meaning than literate. Literacy is the ability to understand, respond, and the ability to integrate language skills with a person's daily habits and behavior to overcome the problems faced (Finn & O'Fallon, 2018).

In the environmental field, literacy is also known, in which it is called environmental literacy. Environmental literacy by the North American environmental education association is declared as the willingness and actions of individuals and groups based on environmental information to act for the welfare of other individuals or groups, and based on this action can prosper individuals and or other groups locally, regionally, or globally (Finn & O'Fallon, 2018; Minkler et al., 2010). Environmental literacy can be classified as the ability of individuals to understand and interpret environmental conditions; from the results of understanding and interpreting them, the individual can decide the right action to maintain, restore, and improve environmental conditions (Kusumaningrum, 2018). Individual who comprehend environmental literacy should be able to understand the relationship between existing systems and the interdependence between humans and environmental systems (Murphy, 2002).

The improvement of environmental literacy is very needed since it is expected that it can enhance awareness of the surrounding environment with the increase in the capabilities of each component (Asfani et al., 2016; Lapsley & Woodbury, 2016; Smith, 2014), and this is also required by students (Husamah et al., 2020). Environmental literacy for someone is a complete awareness to protect the environment (Mutia Ulfah et al., 2020). This conscious attitude is environmental literacy, where a person not only has the knowledge, desire, intention, but also can take real action on the environment and become a brightening agent of environmental problems that occur in his/her area (Chepesiuk, 2003; Tosun & Gursakal, 2016; Wu et al., 2020). Students, as part of the community, should have been prepared as the next generation and as agents for changing thoughts, perceptions, attitudes, and actions requiring the provision of environmental literacy skills (Grant, 2020; McBride et al., 2013; Susilowati et al., 2018).

Generally, perception is often defined as an individual views of an object, and gives a meaning to the situation according to its interests (Biddle et al., 1987). Perception is much determined by functional and structural factors. Functional factor comes from the needs, past experiences, and other things commonly referred to as personal factors such as emotional atmosphere, cultural background, and mental readiness (Arifin et al., 2017; Choudhry et al., 2016). A research conducted in USA and China by Duan (2005) discovers that with different cultural backgrounds and emotional atmosphere, but have the same attitude in environmental management, namely seeing the need for transparent environmental management and education as an effort to prevent environmental damage.

A study about environmental literacy is needed to optimize the quality of environment based on the communities' perception that is always side by side with the environment (Edsand & Broich, 2020; Kaya & Elster, 2019; King & Franzen, 2017; Rahman & Nasri, 2018; Williams, 2017). The communities' perception on environmental can cover up hopes, aspirations, or even desires on certain environmental quality, in which it should be understood subjectively by linking the psychological and socio-cultural aspects of society (Gifford & Nilsson, 2014; Post, 2014). For instance, Haitian farmers have a significant attitude toward the environment by the existence of community perceptions of the vulnerability and severity of land degradation (Bayard et al., 2007). Thus, environmental quality should be generally defined as an environment that meets the ideal imaginative preferences of a person or group of people. This view completes the previous view that defined environmental quality only from physical, biological, and chemical aspects (Sarwono, 1995).

Environmental care behavior or environmental behavior is a trigger for environmental protection (Murphy, 2002; Septian et al., 2016). This behavior is the end of a series of activities in the cognitive domain along with the affective domain. Previous researches that have been done on environmental conservation based on the Community participation (Rahardjanto, 2014) indicate that knowledge and communities' awareness are the important things in environmental protection. Therefore, environmental behavior that can be observed by many people is an embodiment of one's feelings, perceptions, attitudes towards the environment. Sketchily, Septian et al., (2016) identify the existence of reciprocal patterns between knowledge, feelings, and the urge to act. Furthermore, a research conducted by Rahardjanto et al (2017) shows that with the knowledge, feelings, attitudes, and goodwill of the community towards the environment, it will bring out good environmental behavior.

In the high education level, environmental literacy still really needs to be introduced to the students (Ali et al., 2018; Cahyana, 2018; Husamah, Fatmawati, et al., 2017; Rahardjanto et al., 2019). Environmental literacy understanding is necessary to be carried out continuously and sustainably, since the environmental care behavior is a manifestation of individual understanding, perception, intention, attitude, and awareness of the environment (Boca & Saraçli, 2019; Burchett, 2015; Harun, 2012). The uniqueness of prospective teachers who care about the environment is the novelty of research being carried out.

Students have special position due to the expectation that the students can be a leader in the future (Erdoğan et al., 2009; Minarni & Napitupulu, 2017). Students' concern for environmental issues around them will affect the policies they take later when the students have become leaders or part of policy makers. The choice of different study programs/majors allows a different understanding of environmental literacy. However, the students' concern for environment should be a priority for all citizens, regardless of the majors they have taken. Students of Faculty of Teacher Training and Education at University of Muhammadiyah Malang are designed as a leader in the field of education in the future. As a result, the students' concern on the environment requires emphasis that is carried out in a structured, massive, and continuous manner so that this concern for the environment becomes a reflex activity, a concern that will automatically be carried out by everyone.

The purpose that can be revealed in this study is to analyze the students' environmental literacy (component: sensitivity, knowledge, belief, and behavior) of Faculty of Teacher Training and Education (*FKIP*) at Universitas Muhammadiyah Malang based on multidimensional perspective. The urgency of this study is that the environmental literacy for the students is a critical point that needs to be noticed so that the environment be the focus of attention in every decision making in the present and in the future. It is expected that conflicts occur between space, resources, and human interests will be reduced if everyone pays attention to the environment as a consideration for major decisions taken. Important findings in this study are identification of elements that influences behavior related to environmental literacy of students. These elements move in the cognitive and affective domains so that the way of expressing these two domains is very important.

## METHOD

### Type of Research

This study used qualitative research approach which illustrated, represented, or described a phenomenon thru words, images, charts, tables, and even numbers that were qualified. In this circumstance, the researchers illustrated, represented, and described a theoretic model. Seen from the type of research, this study consisted of two types, namely library research and field research. Library research was used to examine various related literature through journals, publication manuscripts, books, and printed official documents. Field research was used to explore real and actual thoughts and actions about the environmental literacy. Questionnaire was developed from The Second Minnesota Report Card on Environmental Literacy (McBeth & Volk, 2009; Murphy, 2002) using a modification.

### Research Design

Research design used in this study was Ex post Facto, in which it was a tracing research on events by tracing backward to find out the factors causing the incident. The approach used in this study was mixed methods by combining quantitative and qualitative researches which functioned as a combined approach in order to obtain holistic data using the Sequential Explanatory Strategy (Tashakkori & Teddlie, 1998; Creswell, 2003; Neuman, 2006). This strategy was carried out by collecting and analyzing the quantitative data first, followed by the collection and analysis of qualitative data. Owing to this strategy, it is hoped that qualitative results will assist to explain the interpretation of quantitative research findings (Creswell, 2003). Quantitative study was conducted to explore the data of Sensitivity, knowledge, belief, and behavior which emphasized on the quantification in data collection and data analysis stages with a deductive approach. This study was descriptive by describing how were the components of students' sensitivity, knowledge, belief, and behavior in environmental literacy. Then, it was constructive in order to describe the tendency that constructed the reality in it. The descriptive data obtained would then be reconstructed on how to overcome the problems that arose.

## Location and Time of Research

This study was conducted in Faculty of Teacher Training and Education – Universitas Muhammadiyah Malang (*FKIP UMM)* on the undergraduate level. This study was carried out from July to October 2020.

## Type of Data and Data Collection Instrument

Type of data in this study were in the form of qualitative and quantitative data. Primary data were obtained from the questionnaire results or online instrument (by means of Google form) that distributed during the study.

## Population and Subject/Respondent

Population of study were all of students of FKIP UMM from all of generation which consisted of 2.750 students. The subjects were chosen randomly by sharing the Google Form link by means of students' WhatsApp group. The data were retrieved within 24 hours after the link was shared, with the assumption that the students who filled in that period were enthusiastic respondents, with a percentage of 5%. Hence, it was found that 139 students (5%) filled out the Google Form with the characteristics as described in the results and discussion section.

## Characteristics of Respondent

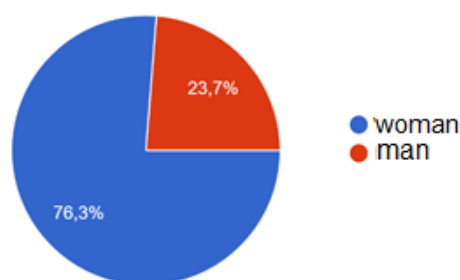Characteristics of respondents in this study were as shown in Figures 1 to 3.



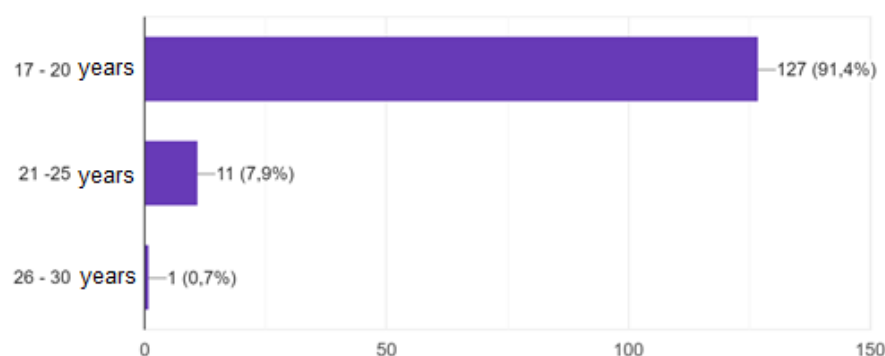**Figure 1.** Characteristics of respondents based on gender



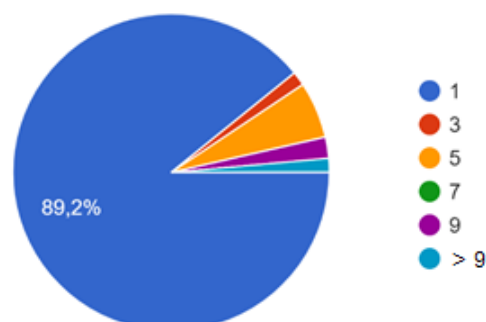**Figure 2.** Characteristics of respondents based on age



**Figure 3.** Characteristics of respondents based on semester level

According to Figure 1, it was known that the responses were dominated by female students (76.3%). This indeed illustrated the condition of the teaching/education faculty in Indonesia which tended to be more in demand by female students, as well as those in the Faculty of Teacher Training and Education, University of Muhammadiyah Malang. Meanwhile, most of the respondents were the students at the initial level (semester 1) with an age range of 17-20 years.

**Data Analysis**

Data analysis of this study used qualitative paradigm and it was reinforced by quantitative paradigm. The data and findings of environmental literacy were analyzed descriptively qualitative analytic. Scaling multidimensional analysis (MDS) was carried out by the Ordination of a series of attributes processed using multidimensional scaling (MDS) followed by a scaling process and a percentage.

**RESULTS AND DISCUSSION**

**Environmental Sensitivity**

***Problem mastery and solutions to the environmental problems***

Figure 4 indicated the percentages of students' selection to their level of mastery on the environmental problems as well as the solutions to the environmental problems.
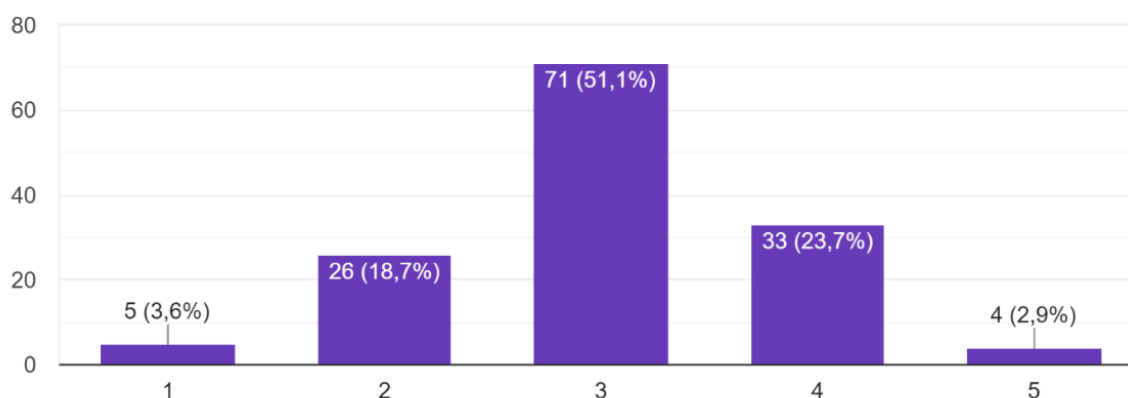


**Figure 4.** Problem mastery and solutions to the environmental problems on the students

Based on Figure 4, it was known that the students' problem mastery and solutions to the environmental problems were in the categories of sufficient and poor. The students tended to be indecisive on their abilities/mastery so that they chose the median (safe value) of 3 (51.1%). 23.7% students were confident that they quite good in mastering the problems and solutions, while there were only 2.9% students who were very confident that they had a very good mastery. However, those numbers were precisely lower than the students who confessed that they really did not master the environmental problems and the solutions (3.6%).

The condition is quite alarming, considering that ideally prospective teacher students should be encouraged to think critically and be able to be a problem solver (Husamah, Fatmawati, et al., 2017). The students should be part of the world community who have concern for the environment and the problems associated with it and have the knowledge, motivation, commitment, and skills to work, both individually and collectively in finding out alternatives or providing solutions to the existing environmental problems now and to avoid new environmental problems arising (Safitri et al., 2019). The students should understand the concepts of environmental science, skilled in identifying the environmental problems and looking for alternative solutions and be aware of being human environmental builders (Utomo, 2016). In college, the students have to be a person who understood that knowledge created is used continuously and it is a place to explore knowledge, solve various problems, a place to criticize the works produced, as well as a place for the formation and development of

student character in order to become students who have high reasoning power, sharp and wide analysis as well (Ali et al., 2018).

### *Environmental information sources*

Figure 5 indicated various sources used by the students to gain the information about environmental themes.
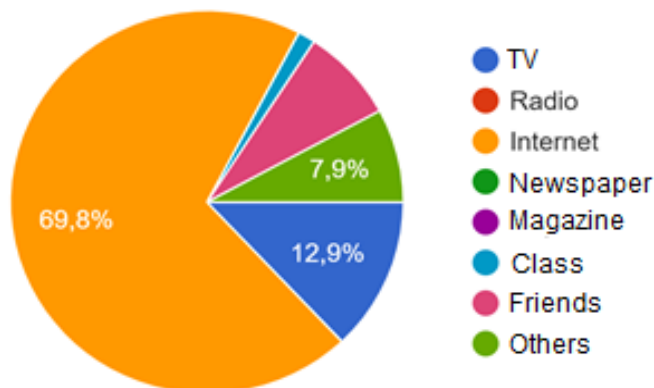


**Figure 5.** Environmental information sources

Figure 5 showed that the students tended to look for the information about environmental themes by means of internet (69.8%). Some of them got the information from various sources. Unfortunately, only a few (<1%) used lectures or classroom moments to ask questions and discuss the environmental themes.

Internet admittedly offers a convenience in gaining and sharing information and it tends to have changed things (Setiawan, 2017). The world of education has also used the internet, including at the middle and high school levels, in which it eases the students (Ratnasari, 2008). However, society tends to focus on the activities of social media and take the information in the social media when using the internet. Thus, several ethics should be recognized by the society as the user of communication media in the form of social networking (Suri, 2019).

The students must really have the ability to sort and pick out the information needed on the internet (Abdurrahman, 2016). In accordance with the information of environmental themes, in a limited number, (7.9%) students stated that they obtained the information through other sources (i.e. scientific journals, proceedings, or books). Anggara et al (2017) emphasize that the students have to think critically in responding to a dynamic world. Hence, Sarkawi (2015) asserts that the students' environmental knowledge must continue to be strengthened In connection with that, according to Alinurdin (2019), the students have to utilize the internet so that they get positive impacts as widely as possible. The internet should be utilized to look for valid sources or main references, i.e. journals, books, proceedings, or another reliable source; thus, the conceptual understanding about critical environmental issues can be deeply understood, as emphasized by Zulfa et al (2015). Various online references (paperless) are used in teaching and learning process based on the college schedule planned, both face-to-face lectures (offline) and online lectures (Millatuzzuhriyah et al., 2020).

### *Local environmental problems*

Figure 6 illustrated the students' sensitivity related to the local environmental problems that they knew around them.
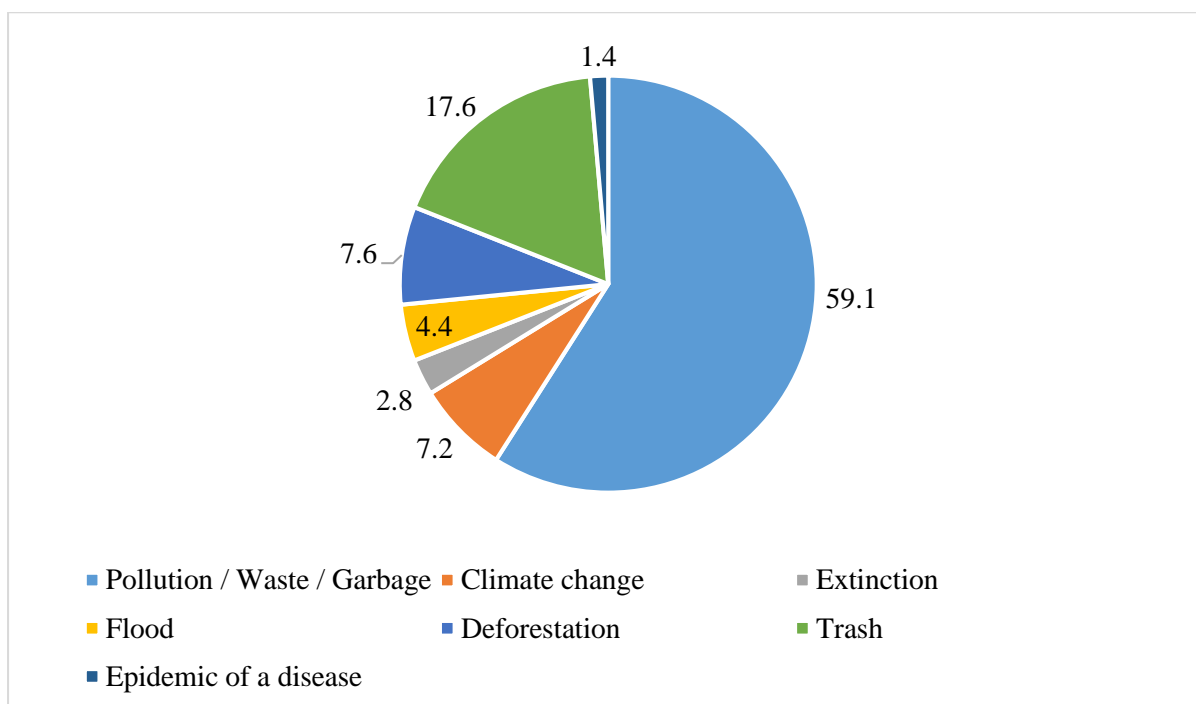
**Figure 6.** Local environmental problems

According to Figure 6, it was known that the students argued about the local environmental problems occurred in their area or even problems that were close to their lives comprised pollution, waste, and garbage (59,1%). The students' sensitivity on the environmental problems around them is an important thing (Husamah, Pantiwati, et al., 2017; Istiana & Awaludin, 2017). This sensitivity is a positive thing, remembering that it is very important to instill the students' sensitivity about environmental problems and pollution caused by toxic and dangerous chemicals or pollution (Mustafa, 2016; Maria Ulfah et al., 2013). It is feared that there is a lack of awareness and sensitivity about pollution/waste that will worsen over time, if no improvement efforts are made immediately it will have an impact on human health as well as greater environmental degradation (Widyasari, 2008).

**Environmental Knowledge**

Figures 7, 8, and 9 indicated the aspect of environmental knowledge of the students in Faculty of Teacher Training and Education of University of Muhammadiyah Malang. Figure 7 showed their knowledge about main sources of water, river, and sea pollutions; Figure 8 indicated their knowledge about anything that became the cause of global warming; and the Figure 9 provided the students' knowledge about the cause of the species extinction.
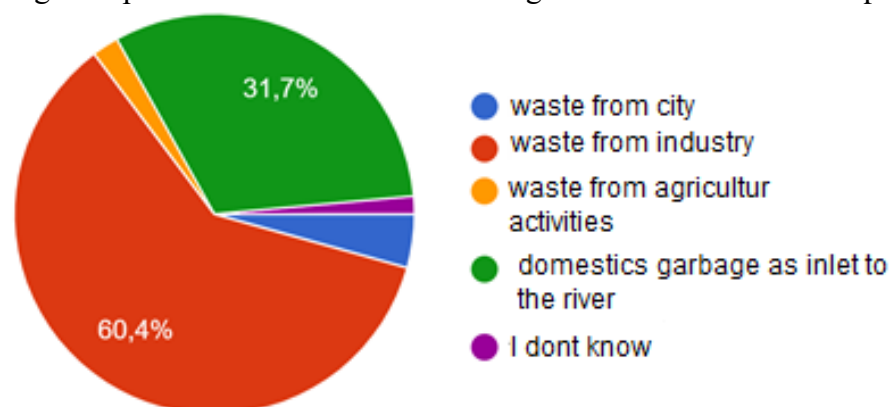


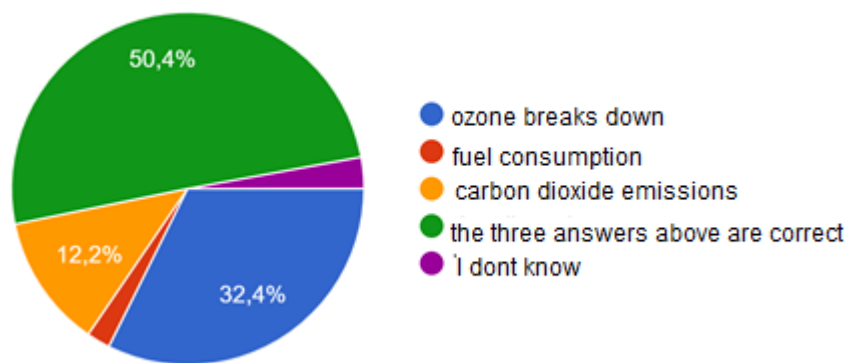**Figure 7.** Main sources of water, river, and sea pollutions
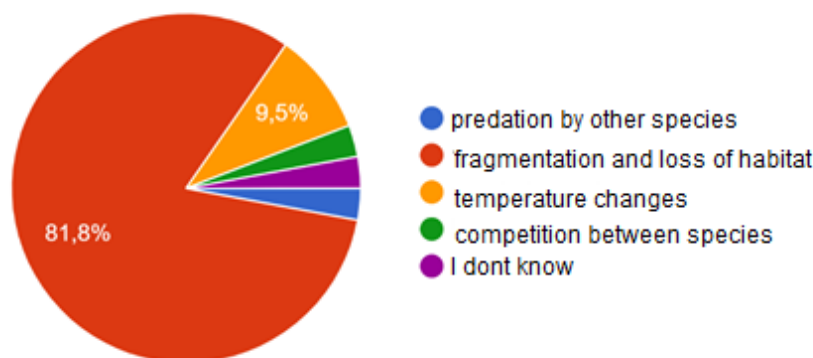
**Figure 8.** Causes of global warming



**Figure 9.** Causes of species extinction

Based on the data in Figure 7, it could be seen that according to FKIP UMM students the main causes of water, river and sea pollutions were waste from industrial activities (60.4%) and domestic waste/household activities (31.7%). Figure 8 provided information that the majority of students considered three things to be the cause of global warming, namely the ozone breaks down, the use of fossil fuels, and carbon dioxide emissions (50.4%). Meanwhile, 32.4% of students stated that global warming was solely due to the ozone breaks down and the rest was partially due to carbon dioxide emissions, the use of fossil fuels, and the unknown. Even though half of the respondents had correct knowledge that the causes of global warming were complex (not just one aspect), we could also say that there were still half of the respondents who had limited or even wrong knowledge. This was certainly very dangerous, especially as they were the nation's future generation and future teacher candidates. According to Maknun (2011), currently, it is necessary to provide adequate teaching staff for prospective teachers in accordance with the demands of the curriculum. The LPTK as a teacher producing institution is expected to have a teacher candidate preparation program that can support the environmental programs, in which it has the capacity and high level of awareness of environmental literacy and conservation actions. Therefore, Ardiani and Hatibe (2020) assume that environmental material especially the phenomena that give important contribution in global warming is very important to be taught to the students who are prospective teachers so that it can supply them with various understandings and learning material.

However, the students' understanding about the causes of species extinction was categorized as very good. The Figure 9 showed that the causes of species extinction were fragmentation and loss of habitats (81.8%). Their argumentations are certainly in line with the research results which indicated that the existence of environmental fragmentation and the loss of habitats cause an extinction, both animals and plants (Krauss et al., 2010; Lander et al., 2019; Rybicki & Hanski, 2013).

**Environmental Beliefs**

Figures 10, 11, 12, 13, and 14 indicated the aspect of environmental beliefs of FKIP UMM students.
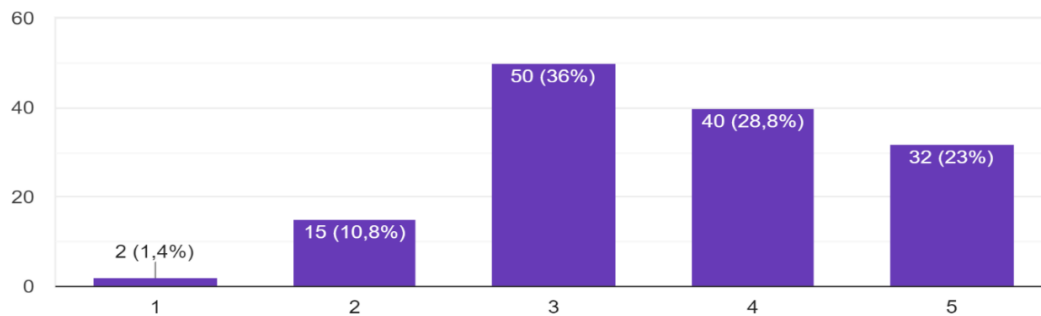


**Figure 10.**   Environmental beliefs in the aspect "Indonesian Society would be able to overcome most environmental problems".
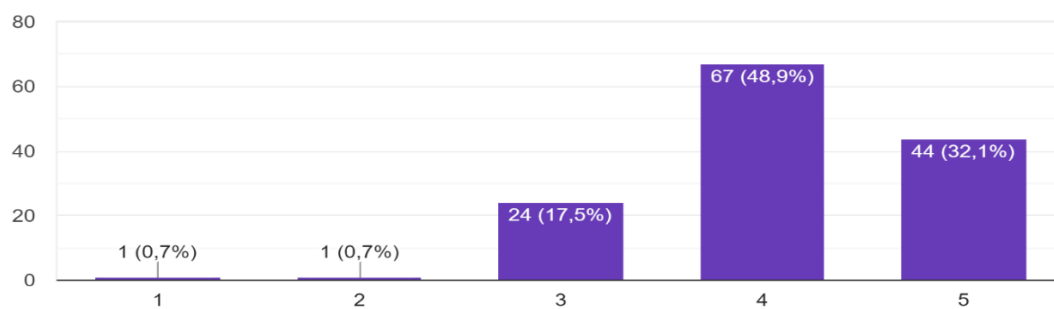


**Figure 11.** Environmental beliefs in the aspect: I could do things that could save the environment
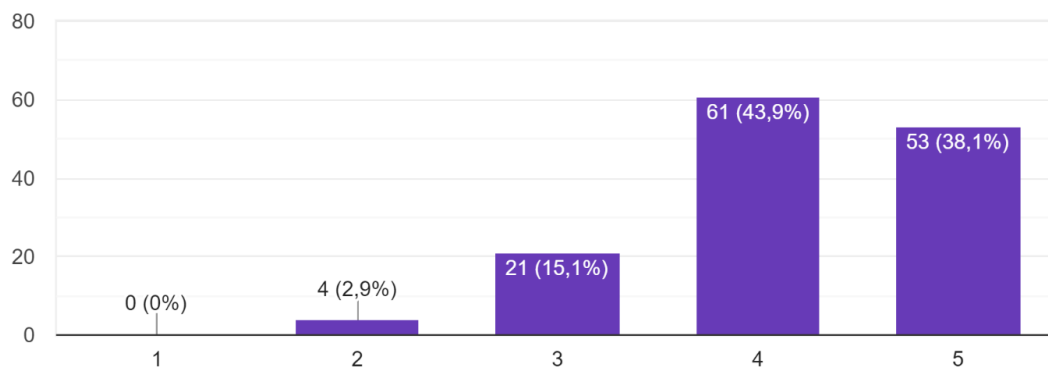


**Figure 12.** Environmental beliefs in the aspect: believe that Indonesian scientists were able to discover a way to solve the environmental problems
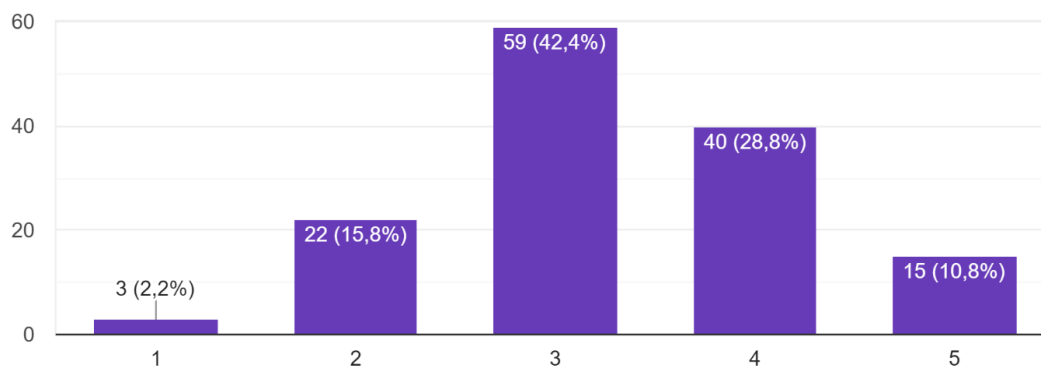


**Figure 13.** Environmental belief in the aspect: The more days, the more people paid attention to the environment
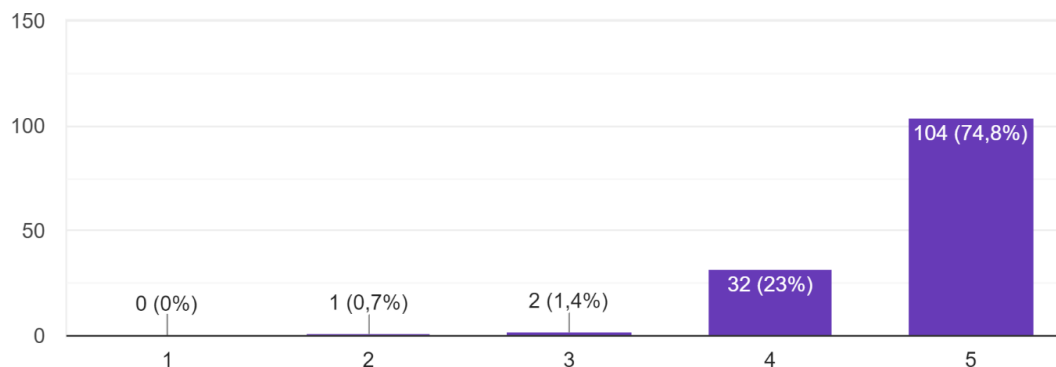
**Figure 14**. Environmental belief in the aspect: If we worked together, the environmental problems would be overcome

The information provided in the Figures 10, 11, 12, and 13 had similar pattern or trends. The students tended to be confident or the students tended to have positive views towards all of aspects, although there were still many who were in the middle position (floating or hesitating). The number who were unsure or disagree were very small (<15%). Interestingly, in Figure 14, it was clear that > 97% of students believed that if they worked together, the environmental problems in Indonesia would be overcome.

High percentages on all aspects of environmental belief were good thing. The existence of belief and self-confidence and a feeling that they are an important component in society, in this case the environmental aspect is a good modality and "therapy" (Edorita, 2014). Environmental problems require partnerships in the spirit of mutual understanding and positive-constructive trust among various stakeholders (Adirini, 2012).

**Environmental Behavior**

Figures 15, 16, 17, and 18 indicated the environmental behavior that practically carried out by the students of FKIP UMM in the daily life.
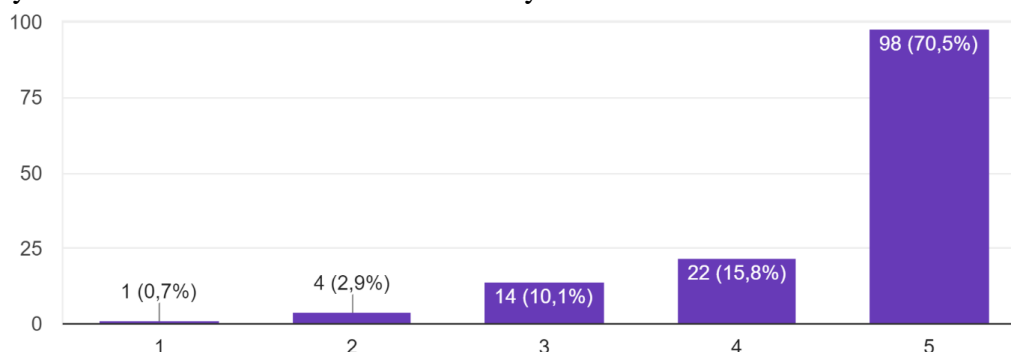


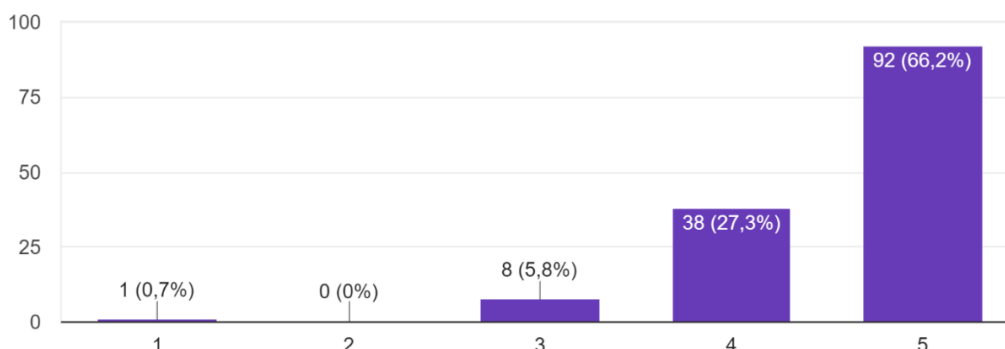**Figure 15.** Turning off the house lights, when not in use



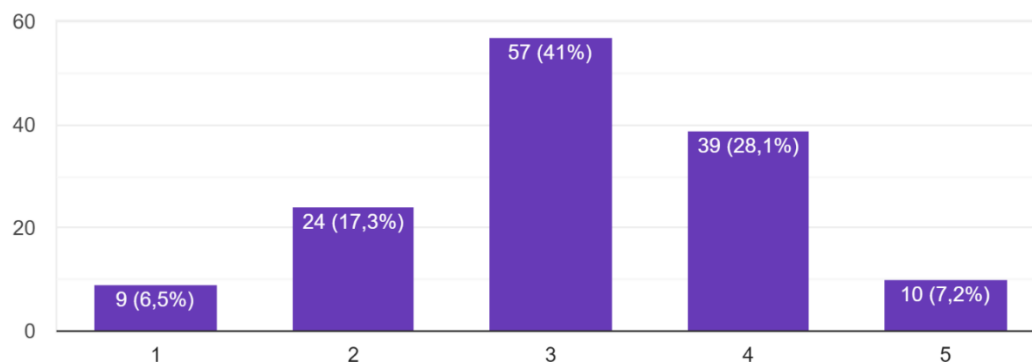**Figure 16.** Throwing the trash in its place
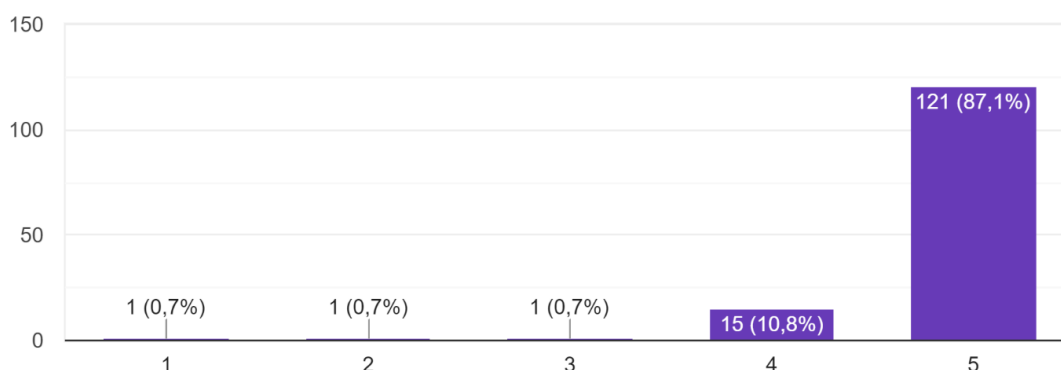
**Figure 17.** Recycling the waste at home



**Figure 18.** Turning off the water tap when not in use

Figures 15, 16, and 18 clearly indicated that most students had positive environmental behavior. The students emphasized that they turned off the house lights when not in use (> 70%), put trash in its place (66%), and turn off the water tap when not in use (> 87%). The results of this study are also in line with previous study that the students tend to have a concern or responsibility to turn off the lights when not in use, turn off water taps, and throw away the garbage (Rahamningtyas et al., 2018; Suciati, 2013).

However, in the aspect of conducting garbage recycles in their house (Figure 18), the student answers tended to vary. In fact, if the answers were neutral/indecisive (41%), combined with those who were not recycling (23,8), the number was higher (i.e. a total of 64,8%) than those who recycled (35,2%). According to Septiani et al (2019), recycle activities really require consistency so that it is worthy of being an effort to reduce plastic consumption since they have to deal with the socio-cultural aspects of society. Based on Andina (2019), If there is no consistent implementation of rules or policies regarding recycle, it will be difficult to establish proper and responsible waste handling behavior. At this point, the right attitude and behavior aspects about the environment are needed.

Behavior is defined as human responses that interpose the object thought into a dimension of consideration and if the attitude is included as behavior, it refers more to behavior that is not visible to the senses (Sarwono, 1995). Environmental behavior is any action or individual reaction to the stimulus or the environment (Depdiknas, 2001). The environmental behavior can be influenced by internal and external factors. The internal factors which influence the behavior physically are gen, nervous system, hormones, and the human brain, while the psychological factors that can influence behavior are personality, mental, intellectual, ego, moral, belief, and motivation.

The external factors that can influence the behavior are socio-cultural, socio-economic, and physical environment factors i.e. education, knowledge, social respect, punishment, culture, norms, information input, group cohesion, social support, religion, economy, politics, and the status and role of individuals in society. Additionally, attitude has big influence in

human life and attitude greatly determines a person's behavior. Attitudes also greatly affect a person's response to social problems, including the environmental problems (Harihanto, 2001). Attitude is also an interaction result of intrinsic factor of individual with its psychological environment (Rakhmat, 2001).

The model of the relationship between knowledge, attitudes, intentions, and behavior is suggested by (Ajzen, 2008). Ajzen asserts a theory that called as The Theory of Planned Behavior, in which it is an enhancement from the previous theory, namely The Theory of Reasoned Action. Basic assumption of Ajzen theory is by seeing that human will behave in a conscious manner and consider all available information. According to Ajzen (2008), attitude is stated as an evaluation form of individual towards object observation provided by beliefs, feelings, or even expected behavior. As one of evaluation responses, reaction stated by attitude is based on an evaluative process from within the individual that provides conclusions on the stimulus in the form of good-bad, positive-negative, pleasant-unpleasant values which then crystallizes as a potential reaction to the object of attitude. Meanwhile, the subjective norms describe the individual's perceptions about the expectations of other people who are considered as important to the individual's supposed behavior.

Attitude Toward Behavior is a subjective assessment of individual, concerning knowledge and beliefs about certain behaviors, pros and cons, benefits as well. Based on the theory of planned behavior (TPB), an attitude is determined by the existence of beliefs on the consequences of behavior. These are called behavioral beliefs. In addition to behavioral beliefs, attitudes are also determined by evaluation toward object such as a person's assessment of the results that emerge from a behavior.

Someone's behavior is an accumulation and organization from the experiences of someone's interaction with the surrounding environment that will produce knowledge, attitudes, and actions. Particularly, behavior is someone's response to the external stimulus with a positive, negative, and/or neutral action.

Notoatmodjo (2007) postulates that from a biological point of view, behavior is an activity of organism concerned. Hence, human's behavior in essence is an action or activity of human itself that has a very wide expanse, including walking, talking, crying, laughing, working, studying, writing, reading, and so on. From those explanation, it can be concluded that human behavior is all human activities, in which it can be directly observed or cannot be observed by the outsiders. Furthermore, Notoatmodjo (2007) proposes that though behavior is a form of response or reaction to the stimulus from external organism (person), yet in responding really depends on the characteristics or other factors from the people concerned. It means that though the stimulus is similar for several people, yet each person is different. The factors that differentiate responses to different stimulus are called behavioral determinants. They are (1) Motivation, (2) Intention; (3) Observation; (4) Learning; (5) Personality and self-concept; and (6) Attitude.

Geller (2001) explains that to change critical behaviors, the focus needed is on overt behavior. Behavior change occurs thru a learning process. The learning process is happened well when the learning process results in a relatively permanent change in behavior. Consequently, it is said that the learning process occurs when the individual behaves, reacts, and responds as a result of learning in a way that is different from the way the individual behaved beforehand. The learning comprises three components, namely (a) Learning involves change, (b) Change must be relatively permanent, and (c) Change regarding behavior.

Another theory claims that someone's behavior will be affected by y the stimulus that is around the person who enters a person and will cause a response. This theory is called the S-O-R (Stimulus-Organism-Response) theory. The S-O-R theory strengthens the theory developed by Ajzen that a person's psychological processes will greatly determine the behavior that will be performed by the person (Algharabat, 2007).

## CONCLUSION

Based on the results and discussion, it can be concluded that (1) Environmental Sensitivity tends to show various conditions. Mastery of problems and solutions to environmental problems in students is low. The students tend to explore information on environmental themes via the internet so it is very prone to transfer of wrong information. However, local environmental problems that occur in student areas are pollution, waste, and garbage which are the most common answers. The students' sensitivity to environmental problems around them is important. (2) Environmental Knowledge. Half of the respondents have the correct knowledge that the causes of global warming are complex (not just one aspect), but there are still half of the respondents who have limited or even wrong knowledge. This is of course very dangerous, especially as they are the nation's future generations and future teachers. However, the students' knowledge of the causes of extinction is classified as very good, due to habitat loss and fragmentation. (3) Environmental Beliefs. The students tend to believe or have a positive view of all aspects, though there are still many who are in the middle position (floating or hesitating). The students believe that if they work together, environmental problems in Indonesia will be resolved, the high percentage in all aspects of environmental belief is a good thing. (4) Environmental Behavior. Most of the students have positive environmental behavior. The students emphasize that they turn off the house lights when not in use, throw away the trash in place, and turn off the water tap when not in use. However, at the aspect of doing recycle waste at home, the answers of students tend to vary, and even more dominantly do not recycle.

## RECOMMENDATION

Departing from the results of study, the recommendation that can be given is the need for more in-depth analysis to truly describe the existing of multidimensional problems and conditions related to the students' environmental literacy. Additionally, there needs to be a linking or focusing of these four components into three main aspects that are in line with the learning studies, namely components of attitudes, knowledge, and skills.

## ACKNOWLEDGEMENT

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