Light Pollution Phenomenon: Prior Knowledge, Attitudes, and Awareness of Physics Undergraduate Students at State University of Surabaya

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Abstract: This is preliminary research by undergraduate students in Physics Department, at Surabaya State University. This study aims to examine the prior knowledge, attitudes, and awareness of the light pollution phenomenon. The preliminary study was carried out on questionnaire sheets. The questionnaire sheets were given to 30 students of the 2020 class physics education program. The questionnaire consists of 21 item questions, divided into 16 Likert scale questions and 5 open questions. The development of the questionnaire considers indicators of prior knowledge, attitudes, and awareness in the case of the light pollution phenomenon. In this study, data analysis was carried out through quantitative analysis. The questionnaire as the research instrument was tested in two stages: validity and reliability using SPSS software statistics. The validity test using Pearson correlation got a 0.779 score. The reliability test using Cronbach's alpha got a 0.800 score. The result of the study showed that 76% of undergraduate students have an average initial knowledge about light pollution with the "good" category, and 68% of them have an attitude of caring for the environment in the case of light pollution phenomena with the category of "care". And the final result is that 66% of them realize that the impact of light pollution is a crucial issue nowadays. Further research is needed for developing the learning media with reference to the current status of prospective physics teachers.

Keywords: Light pollution; Physics education; Preliminary study

Introduction

Light pollution is the inappropriate use of artificial light that causes adverse effects on the environment (NAOJ, 2018). Excess artificial light emitted upwards, scattered by aerosols such as clouds and mist or small particles becomes pollutants in the atmosphere. This scattering produces a glow that can be seen from afar. When viewed from a high place, it looks like a dome of light above the city or often known as the glow of the night sky. Night sky glow is the most common form of light pollution. The negative impacts of light pollution include disturbing human health, disturbing the nocturnal animal environment (especially in reproduction or looking for food), wasting energy, environmental damage, decreasing traffic safety at

night, and the fewer number of celestial objects that can be observed (Prastyo, 2017). Overexposure at night results in high contrast and reduced visibility. This causes discomfort and at the extreme can lead to blindness. The greatest effect of this phenomenon is felt by older people with old eyes and cataracts.

Some of the descriptions of the impact of light pollution above become a common problem, which must be immediately found a solution. One important aspect that plays a role in solving these problems is the field of continuing education or often known as the concept of Education for Sustainable Development (ESD). ESD focuses on developing community attitudes and skills to deal with regional and global issues related to environmental aspects through education, as well as efforts to find relevant solutions to existing problems

(Hariyono et al., 2018). This includes the role of higher education which plays a role in preparing a responsive society regarding the phenomenon of light pollution. Experience of truth and conceptual errors become meaningful in the long-term memory of the learner so that it is hoped that continuous learning will be created (Suprapto et al., 2013).

The ability to identify current problems and issues is one of several advantages that students have in the 21st century. The ability to respond and respond to environmental changes is something that students and students need to have today (Juriah, & Zulfiani, 2019). In the 21st century there are several things that students and students need to have, including being able to organize problems concretely. By being interested in new issues related to natural conditions and the earth. But there are still students who may be ignorant of this. Most students and students are more engrossed in enjoying movies and games than paying attention to news information related to changes in the environment or nature (Julita et al, 2020).

There are also some students who are capable of change. Small changes in the surrounding environment can increase the curiosity of students (Azizah et al., 2017). Associating one phenomenon with another phenomenon will help students in constructing their knowledge. The different characteristics of each student will produce a different response from the two (Fajar & Habibbulloh., 2021). Related to several conditions of student attractiveness in responding and responding to natural events, it is quite interesting to study further. How deep are students in observing environmental changes into a form of assessing the attitude of caring for nature. From this phenomenon, the researchers conducted a study that aimed to identify how students responded to the phenomenon of light pollution. The responses obtained by students can be used as a benchmark for further researchers in developing appropriate learning media to develop responsive attitudes of undergraduate students.

Preliminary studies are carried out to obtain input regarding the object to be researched. In research, it is necessary to have a series of steps carried out in a planned and systematic way in order to get a solution to the problem or get answers to specific problems. Through this study, It is hoped that information can be obtained regarding the issues raised in research and the variables associated with the problem. Studies Preliminary is also a study conducted to sharpen the direction main study. In this case, the preliminary study is in the form of an activity or activities research preparation, with the aim of determining which object and subject in accordance with the research theme which is the focus of the study of the problems to be lifted.

Method

This research was conducted in several steps. Procedures performed by research are presented in the flowchart in Figure 1.
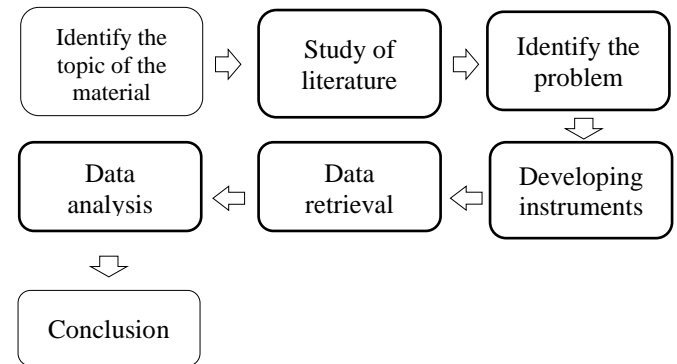

Figure 1. Flowchart Research

The preliminary study was carried out on questionnaire sheets. The questionnaire sheets were given to 30 students of the 2020 class physics education program. The questionnaire consists of 21 item questions, divided into 16 Likert scale questions and 5 open questions. The development of the questionnaire considers indicators of prior knowledge, attitudes, and awareness in the case of the light pollution phenomenon.

The type of research used is descriptive quantitative to analyze prior knowledge, attitudes, and awareness by students regarding the phenomenon of light pollution. Identification of issues and responses to student phenomena is designed with a Likert scale instrument and open questions consisting of 3 categories. In this study, students filled out instruments in the form of; 1) initial knowledge about light pollution, 2) attitudes towards the phenomenon of light pollution, and 3) student awareness of the impact of the phenomenon of light pollution.

The research sample was taken from students teaching IPBA courses in the department Physics. The number of students involved is 30 individuals who have studied the material of light waves, especially the phenomenon of light pollution. The students consist of 5 boys and 25 girls. Retrieval technique the sample was carried out using a purposive sampling technique that looked at the results of the provisions certain.

Data collection was carried out by distributing questionnaires to students containing checklists prior knowledge, open questions related to students' attitudes, and awareness of the phenomenon of student light pollution fill in the questionnaire instrument according to the facts of phenomena that exist in nature related to light pollution.

The questionnaire as the research instrument was tested in two stages: validity and reliability using SPSS software statistics. The validity test using Pearson correlation got a 0.779 score with a very strong linkage category. The Pearson correlation test was used to measure the degree and direction of the relationship between the variables of prior knowledge and students' attitudes and awareness of the phenomenon of light pollution. Based on the results of the Pearson correlation test, it is known that initial knowledge has a positive correlation with student attitudes and awareness. In other words, when students have prior knowledge regarding light pollution, they will encourage a caring and aware attitude toward the surrounding environment.

Cronbach's Alpha coefficient is used to determine the reliability of the instrument (Alwachidy & Supardiyono, 2018). In this case, it is used to determine the effect of prior knowledge on students' attitudes and awareness of the phenomenon of light pollution. The reliability test using Cronbach's alpha got a 0.800 score.

The research data were analyzed using quantitative descriptive data analysis by accumulating the total score in each indicator of the research instrument. After the total score is obtained the percentage using the following equation.

$$Percentage = \frac{\sum score\ obtained\ in\ 1\ indicator}{\sum maximum\ score}\ x\ 100\% \quad (1)$$

The first instrument related to prior knowledge is presented with the statements "Strongly Agree", "Agree", "Disagree", and "Strongly Disagree". In analyzing this data, accumulation is carried out total checklist selected by undergraduate students, then the results obtained are percentages in the chart. To strengthen the answers to the indicators of prior knowledge undergraduate students are also presented with open questions. The second instrument is related to undergraduate student attitude data and the third instrument is related to undergraduate student awareness and is also presented with the statements "Strongly Agree", "Agree", "Disagree", and "Strongly Disagree". In analyzing this data, accumulation is carried out total checklist selected by undergraduate students, then the results obtained are percentages in the chart.

Result and Discussion

The results of student responses to the phenomenon of light pollution are a form of caring attitude to the environment and nature. If students respond positively to the phenomena that. If this happens, it can be said that students have a responsive attitude domain. Based on the research conducted, some research results were obtained as follows.

Prior Knowledge

In the research instrument, students are given 3 statements and 5 open questions related to the phenomenon of light pollution by researchers who aim to explore students' prior knowledge. From the results of data processing obtained graphs of research results in Figure 2.
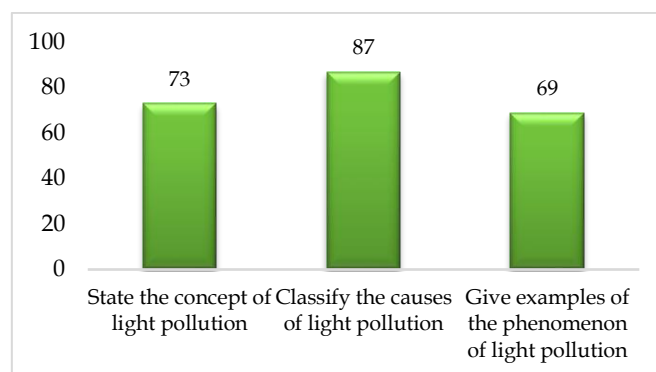

Figure 2. Percentage of Undergraduate Students' Initial Knowledge

Figure 2 shows the percentage of students' initial knowledge regarding the phenomenon of light pollution. Indicators for understanding the concept of light pollution were developed according to (Sumarmo, 2014) namely, (1) states the concept of light pollution; (2) classifying the causes of light pollution; (3) gives an example of the phenomenon of light pollution. From Figure 2 shows the percentage the largest lies in the indicator classifying the causes of light pollution by 87%. Followed by indicators stating the concept of light pollution by 73% and indicators providing examples of the phenomenon of light pollution by 69%. It shows that more than 50% of students have an initial understanding of the phenomenon of light pollution. If averaged 76% of undergraduate students have average initial knowledge about light pollution in the "good" category. By having this knowledge, students are expected to have an attitude of care for nature and the environment. In the domain of knowledge, a good level of student knowledge is influenced by several factors including previous knowledge, experience, sources of information, environment, and the role of parents (Silalahi et al., 2016).

Attitude

In the identification of attitudes towards the phenomenon of light pollution, students are given response questions. Attitude response results to the phenomenon of light pollution are presented in Table 1.

Table 1. Attitude response results in the phenomenon of light pollution

Statement	Result	Percentages (%)
I am part of an individual who can reduce the effects of light pollution.	Agree	100
Light pollution is unavoidable in today's modern times	Agree	100
I only contribute a little to reducing light pollution	Disagree	53
I feel that it is too late to do activities to reduce the effects of light pollution	Disagree	67
I'm not sure that light pollution is actually happening	Disagree	77
I feel that the activities I do not affect light pollution	Disagree	60
I will tend to just look when I find information or news about light pollution	Disagree	70

Table 1 shows the results of the largest percentage of identified attitudes toward light pollution phenomena selected by students. The things that students choose from the first statement to the seventh statement, students answered agreeing to statements number 1 and 2. And answered disagree on statements numbers 3,4,5,6, and 7. If average 68% of them have an attitude of caring for the environment in the case of light pollution phenomena with the category of "care". Students have a positive attitude in response to the phenomenon of light pollution. Sensitive to the environment and show an attitude of caring for the environment. In the attitude domain, the results of moderate achievement on environmental attitudes obtained show that some students already have sensitivity and the ability to think about the environment quite well, as evidenced by the acquisition of attitude values in every aspect. Wulandari & Sulistiyowati (2017) stated that good knowledge can affect the attitude toward caring for the environment in a good direction.

Awareness

In the identification of awareness towards the phenomenon of light pollution, students are given response questions. Awareness response results to the phenomenon of light pollution are presented in Table 2.

Table 2. Awareness response results to the phenomenon of light pollution

Statement	Result	Percentages (%)
Articles, journals, and scientific evidence about light pollution cannot be relied upon	Disagree	57
I think that the biggest contributor to light pollution is the population of developed countries	Agree	80
I don't believe that light pollution is a real problem	Disagree	73
I feel a moral obligation to do something to reduce light pollution	Agree	87
Changes in public awareness are needed to overcome light pollution	Agree	97

Table 2 shows the results of the largest percentage of identified awareness of the impact of the light pollution phenomenon selected by students. The things that students choose from the first statement to the sixth statement, students answered agreeing to statements numbers 2,4,5, and 6. And answered disagree on statements number 1 and 3. If Averaged 66% of them realize that the impact of light pollution is a crucial issue nowadays. Students have awareness of the impact of light pollution. Be sensitive to the environment and show moral awareness to be responsible as an individual who is able to contribute to reducing the impact of light pollution. This awareness will be effective given a socioscientific approach (Khozin et al., 2020). This is in line with the results of the achievement of knowledge and attitudes of students who are in the moderate category. In addition, several factors affect attitudes toward the environment, including personal experience, culture, significant other, information, educational/religious institutions, and emotional factors in individuals (Widianingrum, 2021).

Conclusion

The results of the study stated that the level of initial knowledge of students is 76% of undergraduate students have an average initial knowledge about light pollution with the "good" category, and 68% of them have an attitude of caring for the environment in the case of light pollution phenomena with the category of "care". And the final result is that 66% of them realize that the impact of light pollution is a crucial issue nowadays. Further research is needed for developing the learning media with reference to the current status of prospective physics teachers.

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