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Relationship Between Environmental Knowledge, Pro-Environmental Attitude, and Pro-Environmental Behavior of Employees (Study at PT X)

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ABSTRACT

The rapid industrialization has led to environmental degradation, exacerbated by a lack of pro-environmental behavior. This study aimed to analyze the correlation between environmental knowledge, pro-environmental attitudes, and pro-environmental behavior within the industrial sector. The study was conducted at the workshop of PT X, an Indonesian mining services company with operations across the country. A quantitative research method was employed using simple random sampling to select respondents who completed questionnaires. The data were analyzed using a product moment correlation coefficient test. The results indicated no significant correlation between environmental knowledge, pro-environmental attitudes, and pro-environmental behaviors. However, a significant relationship was found between years of service and the level of environmental knowledge among participants. This suggests that knowledge and attitudes alone are insufficient to promote pro-environmental behavior. Further research is needed to identify these factors and design more effective interventions to promote sustainable industrial practices and mitigate the negative impacts of industrialization.

Introduction

Globally, Indonesia is recognized for its vast reserves of natural resources, including coal. Besides power generation, coal is also a strategic and prioritized commodity for exports. This country is recognized as the world's second-largest coal exporter and a major supplier in Asia. According to the Ministry of Energy and Mineral Resources, coal reserves reach 37 billion tons, while the number of resources is 166 billion tons, representing 3% of the global coal reserves. This commodity is crucial in contributing to the national income and expenditure. Furthermore, Indonesia is recognized as the fifth-largest coal producer, with a relatively significant coal output that contributes approximately 5.5% of the world's output. The development of steam power plant technology and implementation of the Coal Contract of Work (CCoW) licensing system have been instrumental in daily coal production. Most of its production is exported, making Indonesia one of the world's largest coal exporters [1].

According to ecological principles, every activity will always have a positive or negative environmental impact. Despite their positive impacts, mining activities have significant negative impacts, particularly in the form of losses. These losses can occur as damage to humans, equipment, and the natural environment. JATAM (*Jaringan Advokasi Tambang)* states that approximately 44% of Indonesia's land area has obtained approximately 8,588 mining business permits. The area is 93.36 million hectares, approximately four times the size of East and North Kalimantan. These permits have substantially impacted human rights and the environment, as evidenced by JATAM's reports of 45 mining conflicts and 22 instances of pollution and environmental damage by the end of 2020 [2].

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Inappropriate human behavior is one of the primary causes of environmental damage. According to Green et al. [3], behavior can be shaped by predisposing, enabling, and reinforcing factors, with knowledge and attitude as triggers. Therefore, knowledge and attitudes are crucial in shaping an individual's actions. An in-depth study and appropriate strategies are needed to prevent environmental damage and to develop pro-environmental individuals in the company. This follows the mandate of Law No. 32 of 2009 concerning the protection and management of the environment in Indonesia that every individual has the right and obligation to receive environmental education. According to Article 65, everyone has the right to receive education about the environment, access information, participate, and access justice to fulfill their rights. Furthermore, Article 65 obligates all individuals and businesses to provide accurate, transparent, and appropriate environmental protection and management information.

Perseroan Terbatas (PT) X is a company engaged with heavy equipment contractors in the mining industry. Based on initial data, there are still instances of inappropriate environmental behavior exhibited by several employees during the period March to May 2022, particularly in the workshop area. Internal inspections conducted by the company revealed the following instances of inappropriate behavior: 51 in March, 50 in April, and 53 in May 2022. One of the frequent manifestations of inappropriate pro-environmental behavior is improper waste sorting. These behaviors are influenced by employees' environmental knowledge and attitudes. This has prompted further studies on pro-environmental behavior and its relationship with influencing factors, such as environmental knowledge and pro-environmental attitudes.

This study was conducted to better understand environmental behavior issues in the workshop of PT X. Furthermore, the workshop was selected as the study location due to its high environmental aspect and impact risk in its operations, such as the use and management of hazardous and toxic (B3 / *Bahan Berbahaya dan Beracun*) materials and B3 waste in workshop operations. Operational activities are mainly related to the maintenance of heavy mining equipment such as dozers, excavators, and other heavy machinery. Additionally, the location was selected for several other reasons, including great interest in the operational workshop and the absence of similar studies in the same location. This study needs to be performed considering that pro-environmental behavior, specifically in industrial activities, has a significant impact on reducing the negative industrial effects on the environment. Therefore, industry owners, company leaders, the government, and all relevant parties must create a culture of environmental care behavior in every workplace.

Materials and Methods

Study Area

This research was conducted over a three-month period, commencing in November 2022 and concluding in January 2023. The study site was the workshop of PT X, located in North Jakarta. PT X is a company operating in the mining services sector with operational sites spread throughout Indonesia. This location was selected due to the workshop's inherent characteristics presenting potentially significant environmental impact risks. Further considerations included the similarity of work processes to other PT X workshops and the ease of accessibility during travel restrictions imposed by the COVID-19 pandemic.

Data Collection

In this study, data obtained from the survey results using a structured questionnaire were distributed to the respondents. The population comprised all employees of PT X, with a total of 72 people. Furthermore, this study used a questionnaire measuring tool consisting of 28 items. After obtaining the data, validity and reliability tests were conducted. The reliability test obtained a Cronbach's alpha value of 0.741, which was greater than 0.6. Hence, this instrument was considered reliable.

Data Analysis

This study used a quantitative approach to explain the relationships between the variables. Normality, linearity, and multicollinearity tests were conducted on the basis of the collection of valid and reliable questionnaire data. Subsequently, a descriptive analysis was performed to determine the relationship between variables, followed by correlation, data categorization, and Product Moment Correlation Coefficient tests.

Results

The respondents used in this study were male, and based on their age, they were divided into four categories. The study was primarily conducted among employees aged 31–40, with 27 or 43% of respondents participating. This was followed by 26 or 41% of individuals in the 20–30 age group, 9 or 14% in the 40–50 age group, and 1 or 2% over 50. Furthermore, the average age of the employees was 33 years, and respondents were divided into three categories based on their years of service. The study was predominantly conducted among employees in service for 1–10 years, with 50 or 79% of individuals participating. This was followed by 11 or 17% who had been in service for 11–20 years and 2 or 3% in service for 21–30 years. The average age of employees' service years was eight, as shown in Table 1.

Table 1. Respondent characteristics.

Data	Respondent characteristics	Total	Percentage (%)
Gender	Male	63	100
	Female	0	0
Age	20–30	26	41
	31–40	27	43
	40–50	9	14
	50–55	1	2
Years of service	1–10	50	79
	11–20	11	17
	21–30	2	3

In this study, the data obtained through the questionnaire were processed by conducting normality, linearity, and multicollinearity tests. The results of the normality test using the P-P plot and the Kolmogorov-Smirnov normality test are shown below. The P-P Plot normality test showed that the data were normally distributed, as seen from the point spread following the diagonal line in Figure 1. After using the P-P plot, the next step was to conduct the Kolmogorov-Smirnov normality test, which resulted in a value of 0.190, where the data were normally distributed. Subsequently, a linearity test was performed to determine the significant linear relationship between two or more variables.

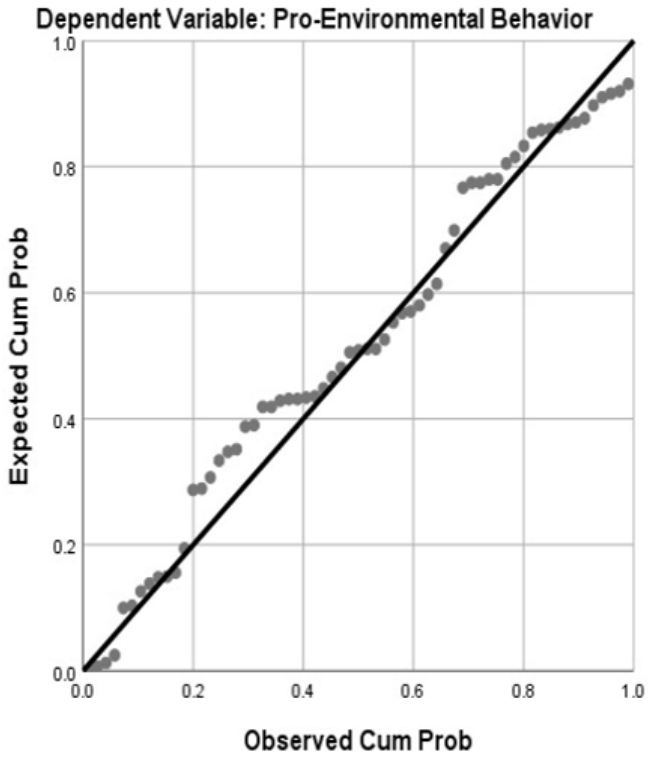

Figure 1. Normal P-Plot.

The linearity test between knowledge and attitude showed a deviation from a significance value of 0.953 ($p > 0.05$). In addition, the test between knowledge and behavior showed a deviation from the significance value of 0.029 ($p < 0.05$). The test between attitude and behavior showed a deviation from the linear significance value of 0.230 ($p > 0.05$). Based on these results, pro-environmental behavior has a linear relationship with attitude, which is directly proportional to environmental knowledge. The multicollinearity test for environmental knowledge and pro-environmental attitude showed a tolerance value of 0.986 ($p > 0.10$) and a variance inflation factor of 1.014 ($p < 10$). Therefore, there was no multicollinearity among the existing factors. A correlation analysis was also conducted between demographic variables, such as age, years of service, and environmental knowledge of employees. The results of this analysis are used to illustrate the relationships between the variables under investigation.

Table 2. Demographic factor correlation analysis with environmental knowledge.

Relationship between variable	Correlation coefficient	Significance
Age with environmental knowledge	–0.106	0.410
Years of service with environmental knowledge	0.252	0.046

Table 2 shows that there was no relationship between age and environmental knowledge ($p > 0.05$). Meanwhile, a positive relationship ($p < 0.05$) was found between years of service and environmental knowledge. Based on these data, a positive correlation exists between an individual's length of employment and their level of environmental knowledge. This is because individuals tend to accumulate more knowledge and experience regarding environmental aspects and the impact of work, as they spend more time in their respective positions. In addition, companies may receive more information or interventions related to environmental knowledge. The data were categorized into good and less good by calculating the average value (Table 3) and were analyzed using the product moment correlation coefficient test to determine the relationship between variables (Table 4). Respondents with a value above and below the average were categorized as "good" and "less good."

Table 3. Distribution of respondent categories.

Variable	Good	Percentage (%)	Less good	Percentage (%)
Environmental knowledge	40	63	23	37
Pro-environmental attitude	31	49	32	51
Pro-environmental behavior	34	54	29	46

Table 4. Product moment correlation coefficient test.

Product moment correlation coefficient test	Coefficient interval	p Value
Environmental knowledge with a pro-environmental attitude	0.119	0.351
Environmental knowledge with pro-environmental behavior	0.115	0.226
Pro-environmental attitude with pro-environmental behavior	0.146	0.254

Discussion

This study aimed to determine the relationship between environmental knowledge, pro-environmental attitudes, and pro-environmental behaviors. The questionnaire showed that 63.5% and 36.5% of the respondents had good and poor environmental knowledge, respectively (Table 3). Environmental knowledge mediates the social capital pathway that influences individual pro-environmental behavior and community participation [4]. The seriousness of these issues has been proven to increase with better understanding and exposure to information [5]. Meanwhile, awareness positively affects pro-environmental behavior and should be supported by the cooperation of educational institutions, the government, and the private sector to strengthen knowledge, attitudes, and behaviors [6]. This is also important in the private sector, as communication can influence consumer behavior [7]. The product moment correlation coefficient test showed no significant relationship between environmental knowledge and pro-environmental attitudes or behaviors. Environmental knowledge and pro-environmental attitudes were 0.351 ($p > 0.05$), whereas environmental knowledge and pro-environmental behavior were 0.226 ($p > 0.05$). This contradicts previous

studies, which found a positive correlation between variables [8]. Moreover, environmental awareness and knowledge significantly influence community involvement in programmes [9].

Regarding pro-environmental attitudes, the collected questionnaire data showed that 49% and 51% of respondents had good and less good attitudes, respectively, as shown in Table 3. Attitude is a key factor in changing environmental behavior [9] and is one of the 15 human values related to the environment [10]. In this study, the product moment correlation coefficient test showed no relationship between pro-environmental attitudes and behavior of 0.254 ($p > 0.05$). In contrast, other studies have stated that attitude strongly associated with pro-environmental behavior and mediates the influence of openness to experience on behavior [11]. Meanwhile, 54% and 46% of respondents had good and less good pro-environmental behaviors, respectively, as shown in Table 3. Behavior significantly affects environmental quality [12]. A study by Ahmad et al. [13] on tourists in Pakistan showed that consciousness and attitude positively and significantly influenced this variable. Attitude has several definitions from experts. Zuchdi [14] stated that pro-environmental behavior is the attitude and actions taken to prevent and improve environmental damage.

In this study, statistical tests using product moment correlation revealed a non-significant relationship with a p value of 0.351 ($p > 0.05$) due to a very low correlation between environmental knowledge and pro-environmental attitude, with a coefficient interval of 0.119. This contradicts previous research; Yusuf et al.'s [15] study on the community indicated that environmental knowledge is positively correlated with pro-environmental attitude. In this study, statistical tests using product moment correlation revealed a non-significant relationship with a p value of 0.226 ($p > 0.05$) due to a very low correlation between environmental knowledge and pro-environmental behavior, with a coefficient interval of 0.155. This result also contrasts with Wolters et al.'s [16] findings, which stated that environmental awareness and environmental knowledge have a significant positive influence on involvement in environmental programs.

In this study, no relationship was found between pro-environmental attitude and pro-environmental behavior based on the product moment correlation analysis. In this study, statistical tests using product moment correlation revealed a non-significant relationship with a p value of 0.254 ($p > 0.05$) due to a very low correlation between pro-environmental attitude and pro-environmental behavior, with a coefficient interval of 0.155. This is contrary to Graves and Roelich's [17] research, which stated that pro-environmental attitude significantly influences pro-environmental behavior. This research indicates that the relationships between variables are still very low based on the coefficient intervals, and the p value suggests no significant relationship between environmental knowledge, pro-environmental attitude, and pro-environmental behavior. This may occur because there are other factors influencing pro-environmental behavior. The very low relationship between these variables may also be due to enabling and reinforcing factors affecting pro-environmental behavior.

Behavior can be shaped by predisposing factors, enabling factors, and reinforcing factors. Knowledge and attitude are predisposing factors for a behavior. Enabling factors are related to supporting facilities for a behavior, including whether the available facilities are adequate in quantity and quality. An example is the availability of separate bins for organic and inorganic waste, recycling facilities, and so on. Providing infrastructure is also a strategy that must be implemented to enhance pro-environmental behavior among PT X workshop employees. Jeong et al. [18] confirmed the importance of adequate facilities for environmental knowledge, which can create a strong awareness in the community to preserve the natural environment. Training is also a supporting factor for behavior and is related to waste management and recycling.

Training is also an enabling factor for a behavior; in this study, whether the company provides training is also an important factor in the presence of pro-environmental behavior. This training can include recycling, waste management, and so on. In addition to predisposing and enabling factors, another factor influencing the formation of a behavior is a reinforcing factor; these factors include laws, regulations, supervision, and so on. In this case, what is relevant to the research locus is the existence of regulations that support the creation of pro-environmental behavior, and a reward and punishment system related to the pro-environmental behavior of employees is also included in this factor. Several possibilities can also prevent the occurrence of a relationship between environmental knowledge, pro-environmental attitudes, and pro-environmental behaviors. An example is the difference between the level of environmental knowledge and pro-environmental behavior that the company or organization wants to promote. This also requires further study because it may be caused by several factors, such as inaccurate environmental knowledge about the desired behavior of the company or organization.

Some studies show that incorrect knowledge can lead to different pro-environmental behaviors. Zhang and Chan [19] showed that knowledge failed to predict attitudes toward the purchase of environmentally friendly products and perceptions of behavioral control. Karasmanaki et al.'s [20] study on farmers stated that interventions to increase pro-environmental attitudes and behaviors did not affect farmers' pesticide practices to reduce environmental impacts. Therefore, strategies aimed at increasing environmental knowledge among the general public do not always lead to the adoption of appropriate practices. Another challenge is the existence of misunderstandings or inadequate understanding from the community. According to Skowron and Sak-Skowron [21], customers who use smartphones in Poland have the misconception that these products are safe and environmentally friendly. Based on the study by Alajärvi et al. [22] in Finland, there is still an inadequate understanding of environmental residues, especially among younger and less educated respondents. This research shows that environmental knowledge must be properly defined to support the desired pro-environmental behavior.

Conclusions

The results showed that 63.5% and 36.5% of the respondents had good and poor environmental knowledge, respectively. Regarding pro-environmental attitudes, 49% and 51% of respondents had good and less good attitudes, respectively. Concerning pro-environmental behavior, the results showed that 54% and 46% of the respondents had good and less good behavior, respectively. Data analysis revealed a relationship between years of service and environmental knowledge. However, there was no significant relationship between environmental knowledge, pro-environmental attitudes, and pro-environmental behavior. This could be due to inaccurate environmental knowledge, resulting in different pro-environmental behaviors, incorrect understanding, and low attitude levels. Further studies should be conducted to explore other enabling and reinforcing factors. An in-depth analysis is needed to determine appropriate interventions to improve employees' pro-environmental behavior.

Author Contributions

LMAD: Conceptualization, Methodology, Software, Writing - Review and Editing; **TEBS**: Conceptualization, Methodology and Review; **F**: Conceptualization, Methodology, Review

Conflicts of Interest

There are no conflicts to declare.

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