

# Prospective Teachers Knowledge About the Air Pollutant Standard Index and Fire Disaster Mitigation

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## ABSTRAK

Pengetahuan calon guru sekolah dasar tentang pengetahuan Indeks Standar Pencemar Udara (ISPU) dan mitigasi bencana kebakaran hutan dan lahan sangat penting. Penelitian ini bertujuan untuk menganalisis pengetahuan indeks baku pencemaran udara dan mitigasi bencana kebakaran hutan dan lahan calon guru sekolah dasar. Pendekatan dalam penelitian ini menggunakan penelitian survey kuantitatif. Populasinya adalah calon guru sekolah dasar dengan jumlah 3000 dan sampel penelitian 336 orang. Variabel penelitian ini adalah pengetahuan calon guru sekolah dasar. Instrumen penelitian yang digunakan adalah instrumen soal tes yang dibuat dengan Google Forms dan disebarluaskan melalui platform media sosial berupa What Apps. Analisis data penelitian menggunakan deskriptif kuantitatif. Hasil penelitian menunjukkan klasifikasi pengetahuan calon guru sekolah dasar tentang standar indeks mitigasi bencana pencemaran udara dan kebakaran hutan berdasarkan letak geografis asal universitas atau perguruan tinggi terdiri dari dua kategori yaitu kategori sangat baik dan kategori sedang. Kesimpulan dari penelitian menunjukkan bahwa pengetahuan indeks standar pencemaran udara dan penanggulangan bencana kebakaran hutan dan lahan calon guru sekolah dasar di Provinsi Riau, Indonesia berada pada kategori sedang.

## ABSTRACT

The knowledge of prospective elementary school teachers about knowledge of the Air Pollutant Standard Index (ISPU) and forest and land fire disaster mitigation is essential. This study aimed to analyze knowledge of the air pollutant standard index and forest and land fire disaster mitigation of prospective elementary school teachers. The approach in this research is to use quantitative survey research. The population is elementary school teacher candidates, with a total of 3000 and 336 research samples. The variables of this study are the knowledge of elementary school teacher candidates. Research instrument used is a test question instrument made with Google Forms and distributed through social media platforms in the form of What Apps. Analysis of research data using descriptive quantitative. The results showed that the knowledge classification of prospective elementary school teachers regarding the standard index of air pollution and forest fire disaster mitigation based on the geographical location of the origin of the university or college consisted of two categories, namely the excellent category and the moderate category. The conclusions from the study show that knowledge of the standard index of air pollution and disaster mitigation of forest and land fires for elementary school teacher candidates in Riau Province, Indonesia is in the medium category.

## 1. INTRODUCTION

Natural disasters have a complex impact on every aspect of life from an economic, social, and health perspective. Natural phenomena related to disaster threats include tsunamis, eruptions, tectonic earthquakes, volcanic earthquakes, earthquake tremors, multiphase earthquakes, hot clouds, hot lava, cold lava, lava domes, and volcanic ash, which are increasingly known to the public (AghaKouchak, 2018; Rai & Khawas, 2020). That is the learning society accepts. People become familiar with the natural environment and its phenomena or symptoms (Hardi et al., 2018; Suarmika et al., 2022). Natural phenomena like natural disasters do not need to be treated negatively but should be treated positively. These natural phenomena should be accepted with common sense and rationale, with no need to associate them with irrational, mystical things from the side of scientific thought (Akhmad et al., 2018;

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Hutagalung, 2020). What needs to be done by the community is how to prevent various natural phenomena from disturbing the comfort of human life. A disaster is an unexpected event from natural or non-natural sources, including the haze caused by forest and land fires. Forest and land fires are national-level disasters that are still being discussed yearly. The forest fires causing haze in Indonesia is still high, and Riau is at the first level of fire, which is relatively high on the island of Sumatra (Eddy Noviana et al., 2020; Wiguna et al., 2021). The driving factors base on previous study influence the occurrence of forest and land fires in Riau Province include three factors, namely: (1) environmental biosphere factors, (2) socioeconomic factors, and (3) spatial policy factors (Maharani, 2020). First, land cover, rainfall, elevation and slope, river network and road accessibility, and biophysical characteristics affect forest and land fires in the biosphere. Then certain climatic factors, such as the dry season, also increase the potential for forest and land fires (Alig, 2012; Fang, 2019). Then social and economic factors significantly affect the existence of forest and land fires because human activities significantly affect the environment, such as land clearing activities carried out in a way that is not very friendly to the environment, leading to wildfires.

Forest fires will cause ecological damage and decrease air quality around the fire. Smoke is a matter of great concern for its existence because it can cause several diseases that can endanger human respiration. Smog contains hundreds of aerosol compounds that are elemental and organic carbon, including metals and free radicals that can damage the respiratory tract in humans (Elbaar, 2020; Yustina & Kapsin, 2017). Previous study state the smog can also cause several, such as headaches, eye, nose, and throat discomfort, difficulty breathing, and psychological stress (Saarnio et al., 2010). So, an air quality index is called the Air Pollutant Standard Index (ISPU). This index can see the ambient air quality at a specific location based on the impact on human health, aesthetic value, and health. Knowledge of ISPU is a form of disaster mitigation knowledge. Disaster mitigation is a conscious effort to reduce all disaster risks through development in physical and social conditions that are useful for increasing awareness, knowledge, and community capacity in dealing with disasters. In addition, Law no. 24 of 2007 concerning Disaster Management in Article 1 paragraph (6) states that implementing disaster management is a series of efforts that include developing policies that pose a risk of disaster, disaster prevention activities, emergency response, and rehabilitation.

One way to be done this is to build a culture of disaster awareness. Mitigation and education related to disasters, including forest and land fires, must be strengthened early (Verlenden et al., 2021; Xu et al., 2018). The community should have started to cultivate disaster awareness behavior. Increasing and regularizing rescue exercises carried out in the event of forest and land fires can also be one way to form a beneficial habit if actual forest and land fires occur (Gerdan, 2014; Ng, 2022). The importance of increasing knowledge about disasters must be socialized, especially for children of elementary school age who still do not understand what they should do if a disaster strikes. Mitigation activities aim to improve community preparedness and reduce disaster risk for the long term, reduce the number of victims, and be implemented as much as possible to minimize the impact (Arviansyah et al., 2021; Hamid, 2020; Suarmika et al., 2022). If there is a discourse on mitigation, it is necessary to have disaster education that can be carried out in schools. Once again, implementing disaster mitigation education in schools must be carried out early to provide deep knowledge and readiness for actions that need to be taken before/when an unexpected natural disaster occurs to minimize any impacts—implementing disaster mitigation in schools influences children's preparedness from an early age (A. Sakurai et al., 2018; Wardana et al., 2021). The research results found that the problems encountered in implementing disaster mitigation education were teachers' limited knowledge and abilities about disaster content and not yet the basis for sustainable implementation (Apriyanti, 2019). Therefore, teachers must be equipped with disaster mitigation knowledge to be taught and conveyed to students (Kurnia & Fauzi, 2020; E. Noviana et al., 2019; Aiko Sakurai et al., 2020).

Pedagogic Content Knowledge (PCK) combines content and pedagogic knowledge by integrating teacher experience to teach the material (Koehler & Mishra, 2009; Schmidt et al., 2014). Content knowledge is the teacher's knowledge of the breadth and depth of the material taught to students based on their experience (Retno Susilorini et al., 2021; Shulman, 1986). Pedagogic or pedagogic knowledge is the teacher's knowledge about selecting factors and supports related to teaching-learning materials based on the teacher's expertise (Magntorn & Helldén, 2017; Xavier, 2019). PCK is essential for a teacher because the teacher will easily integrate the experience he has to choose in presenting learning materials and how to teach them. With PCK, teachers can quickly adapt to the learning being carried out, primarily if the learning environment for students and teachers in an environment supports the presentation of the material taught by the teacher (Dissanayaka et al., 2022; Mishra & Koehler, 2006). Based on this, it is essential content knowledge and pedagogical knowledge of preservice teachers of primary school education about knowledge of the air pollutant standard index and forest and land fire disaster mitigation to teach disaster mitigation knowledge to students. Based on the explanation that has been mentioned

above, the research tries to analyze knowledge about the standard index of air pollution and disaster mitigation of forest and land fires for preservice elementary school teachers.

## 2. METHOD

The research uses a quantitative survey method to provide an overview of the interpretation of data on the knowledge of the air pollutant standard index and disaster mitigation of forest and land fires for preservice teachers of primary school education in Riau Province (Cresswell & Cresswell, 2018). The research population is preservice teachers of primary school education in four universities in Riau Province. The random sampling technique did determination of the research sample. The number of populations and samples can be seen in Table 1.

**Table 1. Research Respondents**

No	Universities	Research Population	Research Sample
1.	PToPSE-01	624	64
2.	PToPSE-02	1126	32
3.	PToPSE-03	697	212
4.	PToPSE-04	553	28
<b>Total</b>		<b>3000</b>	<b>336</b>

The variables of this study consisted of two aspects, namely: (1) knowledge of aspects of the air pollutant standard index (ISPU); and (2) knowledge of forest and land fire disaster mitigation; more details can be seen in Table 2.

**Table 2. Aspects and Indicators of Research Variables**

No	Aspect	No	Indicator
1	Knowledge of the Air Pollutant Standard Index (ISPU)	1	State the functions and uses of ISPU
		2	Distinguishing the air quality index displayed on the ISPU
2	Knowledge of forest and land fire disaster mitigation	1	Explain the symptoms and causes of forest and land fires
		2	Explaining the activities or activities before, during, and after the forest and land fire disaster

Based on Table 2, the research instrument used is a test question instrument made with Google Forms and distributed through social media platforms in the form of What Apps—analysis of research data using descriptive quantitative. The criteria for determining the level of knowledge are used, as shown in Table 3.

**Table 3. Range of Scores and Knowledge Categories**

Score Range	Categories
> 75	Excellent
56 - 75	Medium
< 56	Less

## 3. RESULT AND DISCUSSION

### Result

The research respondents were prospective elementary school teacher students currently studying at four tertiary institutions in Riau Province. One of the four universities is a state university, and three are private. The gender of research respondents consisted of male and female students taking semester one to semester nine. Respondents are students who have attended or are taking environmental education courses and disaster mitigation. Respondent data by gender is show in Table 4.

**Table 4. Respondent Data by Gender**

No	Universities/ College	Gender				Total	%
		Male	%	Female	%		
1.	PToPSE-01	3	4.69	61	95.31	64	100.00
2.	PToPSE-02	5	15.63	27	84.3	32	100.00

No	Universities/ College	Gender				Total	%
		Male	%	Female	%		
3.	PToPSE-03	34	16.04	178	83.96	212	100.00
4.	PToPSE-04	2	7.14	26	92.85	28	100.00
	<b>Total</b>	<b>44</b>	<b>13.10</b>	<b>292</b>	<b>86.90</b>	<b>336</b>	<b>100</b>

Based on Table 4, the respondent's data by gender shows that the male sex has a total of 44 respondents with a percentage of 13.10%. Universities that have the most respondents based on male gender came from PToPSE-03 with as many as 34 respondents with a rate of 16.04%, then followed by PToPSE-02, as many as five respondents with a percentage of 15.63%, PToPSE-01 with as many as three respondents with the rate of 4.69% and PToPSE-04 as many as two respondents with a rate of 7.14%. Then respondents with female gender from the four universities, as many as 292 respondents, with a rate of 86.90%. Universities that have the most respondents based female are PToPSE-03 as many as 178 respondents with a rate of 83.96%, then PToPSE-01 as many as 61 respondents with a percentage of 95.31%, PToPSE-02 as many as 27 respondents with a rate of 84.3 % and PToPSE-04 as many as 26 respondents with a rate of 92.85%. The data above shows that the female has the most respondents, with 292 respondents, and the male totaling 44, with 336 respondents.

The knowledge of prospective elementary school teachers about knowledge of the air pollutant standard index and disaster mitigation of forest and land fires is essential. By having disaster knowledge from preservice elementary school teachers, it is hoped that it can be transferred to students when they become teachers. Primary school teacher candidates are based on a developed and validated question instrument distributed to respondents in measuring and investigating the knowledge of the air pollutant standard index and forest and land fire disaster mitigation. The question instrument consists of ten questions, with the following details: (1) aspect 1, indicator 1 is number 1-3, (2) aspect 1, indicator 2 is number 4-6; (3) aspect 2, indicator 1 is question number 7, and (4) aspect 2, indicator 2 is number 8-10. The distribution of the number and percentage of correct answers from respondents based on knowledge test questions of the air pollutant standard index and forest and land fire disaster mitigation can be seen in Figure 1.

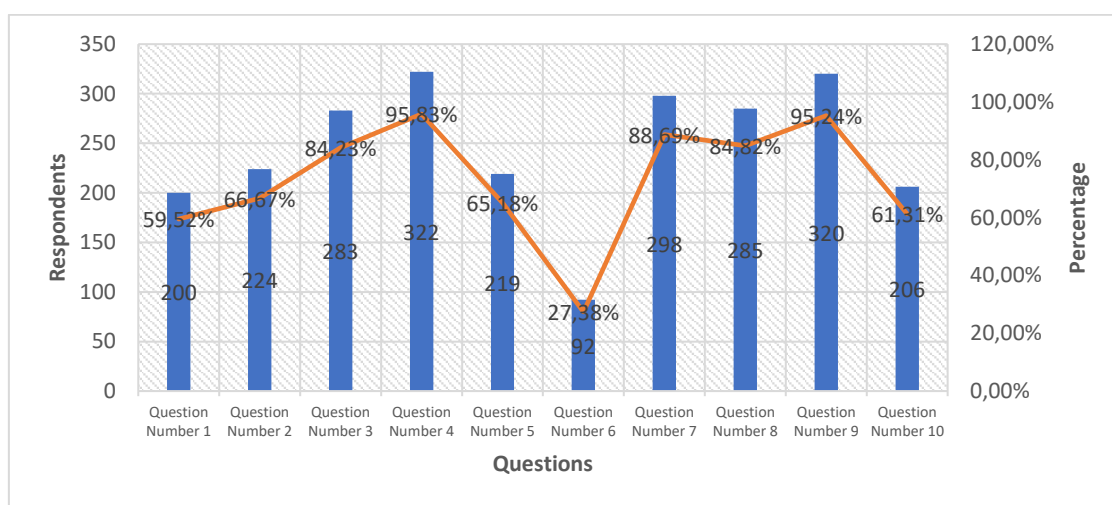


Figure 1. Number and percentage of correct answers from respondents

Figure 1 provides an overview of the number and percentage of correct answers from respondents based on the knowledge test questions on the standard index of air pollution and forest and land fire disaster mitigation with details: (a) in question number 1 answered correctly by 200 respondents with a rate of 59.52%; (b) question number 2 was answered correctly by 224 respondents with a rate of 66.67%; (c) question number 3 was answered correctly by 283 respondents with a rate of 84.23%; (d) question number 4 was answered correctly by 322 respondents with a rate of 95.83%; (e) question number 5 was answered correctly by 219 respondents with a rate of 65.18%; (f) Question number 6 was answered by 92 respondents with a rate of 27.33%; (g) question number 7 was answered correctly by 298 respondents with a rate of 88.69%; (h) question number 8 was answered correctly by 285 respondents with a rate of 84.82%; (i) question number 9 was answered correctly by 320 respondents, with a rate of 95.24%, and (j) question number 10 was answered correctly by 206 respondents with a rate of 61.31%.

Knowledge of preservice teachers of primary school education is a crucial competency and must be possessed. Preservice teachers of primary school education should know the basic concepts of forest and land fire disaster mitigation as a form of prevention taught to elementary school students. Knowledge of forest and land fire disaster mitigation for preservice teachers of primary school education is one aspect of achieving pedagogic competence. This study will investigate the knowledge of the air pollutant standard index and disaster mitigation of forest and land fires for preservice teachers of primary school education in Riau Province, Indonesia. The following provides data on preservice teachers of primary school education knowledge of the air pollutant standard index and forest and land fire disaster mitigation, as presented in Figure 2.

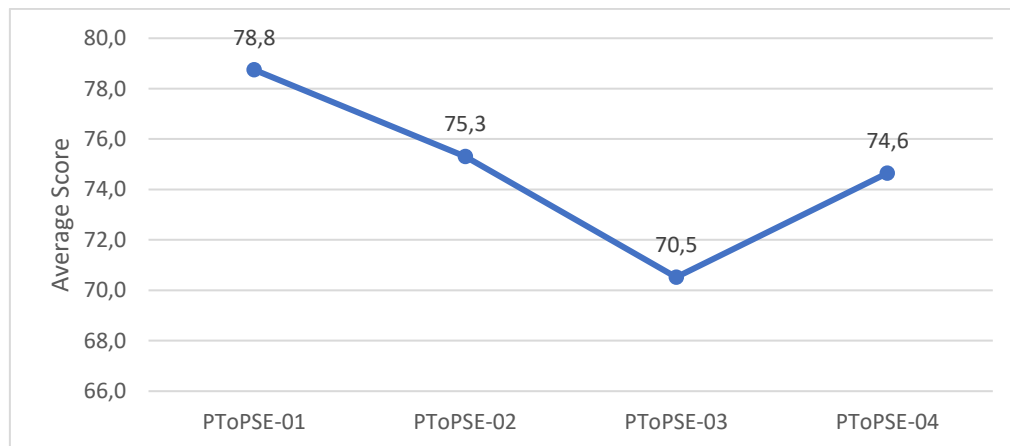


Figure 2. Knowledge Level of Prospective Elementary School Teachers

Based on the data in Figure 2, it can be seen that the knowledge level of prospective elementary school teachers regarding knowledge of the quality standard index for air pollution and forest and land fire disaster management is in the medium category with a score of 74.31. The following is data on the knowledge of prospective elementary school teachers classified based on the origin of the university or college providing education that produces preservice elementary school teachers. A university or college with code PToPSE-01 consisting of 64 respondents (19.05%) is included in the excellent category with an average score of 78.8. Then universities or colleges with a PToPSE-02 code composed of 32 (9.52%) are in the excellent category with a score of 75.3. Furthermore, the university or college with the PToPSE-03 code consists of 212 respondents (63.10%) in the medium category with an average score of 70.5. And universities or colleges with code PToPSE-04 consisting of 28 respondents (8.33%) are in the medium category with an average score of 74.6.

**Discussion**

This research was conducted at four universities or colleges in Riau Province, which provide education to produce prospective elementary school teachers. The four universities consist of one state university and three private universities. The study aimed to analyze the knowledge of air pollutant standard indexes and disaster mitigation of forest and land fires for elementary school teacher candidates. The study results show that this knowledge is generally in the medium category. However, if further analyzing the categorization of knowledge from the four universities or colleges, information is obtained that two universities or colleges are in the excellent and medium categories. The excellent category comes from universities or colleges in urban areas, while the medium category comes from universities or colleges in the district (region). Based on the research findings, it can be concluded that the difference in knowledge about the standard index of air pollution and forest and land fire disaster mitigation for elementary school teacher candidates is influenced by geographical location, which contributes to the pattern of socialization of the learning environment as a support for learning so that it has an impact on students' knowledge. Geographical location contributes to the socialization pattern of the learning environment as a support for learning so that it can influence one's knowledge (Ellis & Goodyear, 2016; Granito & Santana, 2016; Leijon et al., 2022; Owoseni et al., 2020). It is caused by several factors, including: (a) different geographic locations will create different environments; for example, urban environments have other characteristics from district (regional) environments. It can affect learning and interact with the surrounding environment; (b) cultural differences: other geographical locations can also create cultural differences that can affect students' socialization patterns in learning (Corrochano et al., 2022; Suarmika et al., 2022). Thus, geographical location can contribute to the design of socialization of



the learning environment as a support for education because it can affect how prospective elementary school teachers learn and interact with the environment as support for acquiring knowledge. One form of the socialization pattern of the learning environment as a support for the learning of prospective elementary school teachers based on different geographic locations is through disaster mitigation education.

It is hoped that disaster mitigation education can stimulate the knowledge of prospective elementary school teachers about forest and land fire disaster mitigation. Therefore it is necessary to design the substance of disaster mitigation materials that can be used in learning (Kastolani & Mainaki, 2018; Eddy Noviana et al., 2023). The material sense is mitigation knowledge before and when a disaster occurs (Nathan & Scobell, 2012; Eddy Noviana et al., 2019). Knowledge of disaster mitigation is essential for everyone; understanding the importance of disaster mitigation is one of the efforts to reduce disaster risk (Dar & Alam, 2020; Kawata et al., 2021; Oe & Yamaoka, 2021). Furthermore, knowledge of disaster mitigation can help to acquire skills and training to help oneself and others in the event of a disaster. One is developing models and teaching materials for learning forest and land fire disaster mitigation. The results of research conducted show that the model and development of teaching materials for disaster mitigation literacy education significantly increase students' knowledge literacy regarding disaster mitigation knowledge (Permana, 2022). The implications of this study illustrate that geographical location determines the pattern of socialization in the learning environment as a support for learning, thus influencing knowledge about the standard index of air pollution and disaster mitigation of forest and land fires for prospective elementary school teachers. Therefore, it is necessary to design a socialization pattern in the same learning environment for elementary school teacher candidates based on differences in geographical location. One way is to provide basic disaster knowledge through disaster mitigation education, especially forest and land fire disasters. It is hoped that disaster mitigation education can facilitate prospective elementary school teachers to gain an understanding of the standard index of air pollution and disaster mitigation of forest and land fires. However, this research still has limitations, namely only exploring disaster knowledge on one type of disaster based on geographical location. Therefore, it is hoped that further research can expand and deepen the scope of research related to knowledge of all kinds of disasters and other factors that influence them.

#### 4. CONCLUSION

The conclusion shows that knowledge of the standard index of air pollutants and forest and land fire disaster mitigation in prospective elementary school teachers is in the medium category. The acquisition of knowledge categories is based on the knowledge of the air pollutant standard index and forest and land fire disaster mitigation. Therefore, it is necessary to have activities that can increase the knowledge and abilities of preservice teachers of primary school education about the air pollutant standard index and forest and land fire disaster mitigation by routinely conducting rescue exercises in the event of forest and land fires, and also as a finding in compiling and designing disaster risk reduction education, especially forest and land fire disasters.

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