



Investigating Geo-disaster Knowledge, Attitude, and Practices among Secondary School Students in Cameron Highlands, Pahang, Malaysia

Nasir Nayan^{1*}, Aimuni Syarah Abdullah¹, Hanifah Mahat¹, Mohmadisa Hashim¹, Yazid Saleh¹, Zahid Mat Said², Nurul Khotimah³, Edi Kurniawan⁴

¹ Faculty of Human Sciences, Universiti Pendidikan Sultan Idris, Tanjung Malim 35900, Malaysia

² Faculty of Science and Mathematic, Universiti Pendidikan Sultan Idris, Tanjung Malim 35900, Malaysia

³ Fakultas Ilmu Sosial, Universitas Negeri Yogyakarta, Yogyakarta 55281, Indonesia

⁴ Fakultas Ilmu Sosial, Universitas Negeri Semarang, Semarang 50229, Indonesia

Corresponding Author Email: nasir@fsk.upsi.edu.my

Copyright: ©2024 The authors. This article is published by IETA and is licensed under the CC BY 4.0 license (<http://creativecommons.org/licenses/by/4.0/>).

<https://doi.org/10.18280/ije.070218>

ABSTRACT

Received: 21 March 2024

Revised: 7 May 2024

Accepted: 15 May 2024

Available online: 30 June 2024

Keywords:

geo-disaster literacy, knowledge, attitudes, practices, climate change

This study uses a quantitative technique and questionnaires to assess geo-disaster literacy among Cameron Highlands schoolchildren, where flash floods and landslides are common. Simple random sampling with descriptive and inferential analysis (ANOVA and Spearman's Rho correlation) was used to sample 327 Form 3 students. The findings demonstrate strong knowledge, attitude, and practice ($M=4.34$, $SP=2.08$). A one-way ANOVA study reveals a significant difference between knowledge and attitude ($F=6.372$, $P<0.001$, $p\text{-value} < 0.05$). A one-way ANOVA analysis shows a significant relationship between geo-disaster knowledge and practice ($F=7.901$, $P=0.001$, $p\text{-value} 0.05$). Additionally, One-way ANOVA analysis reveals a significant difference in geo-disaster attitudes and practices ($F=4.106$, $P<0.001$). Spearman's Rho analysis indicates a weak positive correlation ($r=.406$, $p<0.001$) between knowledge and attitude. The association between knowledge and practice is moderate ($r=.412$, $p0.001$) and positive. A moderate positive connection exists between attitude and practice ($r=.415$, $p0.001$). In conclusion, students understand and practice geo-disasters. Students are exposed to geo-disaster literacy. The government must create a geo-disaster literacy program.

1. INTRODUCTION

The arrival of tourists at the highland has contributed to the rapid development of the place and symbolizes economic progress. However, physical development has negatively impacted the environment, resulting in geo-disaster and physical changes in the soil and climate elements [1]. Geo-disasters refer to the natural processes of the earth or phenomena that can disrupt the daily activities of the community and the country, resulting in loss of life, damage to public property, and destruction of the environment, thus leading to losses to the country. Generally, geo-disasters in Malaysia fall into five categories: floods, earthquakes/tsunamis, landslides, coastal erosion, and sea level rise. However, geo-disasters that often occur in highland areas are floods and landslides. Landslides and floods directly affect the physical environment and the human environment.

This study measured the level of literacy on geo-disasters among Form 3 students with knowledge of geo-disasters, attitudes, and practices towards geo-disasters. Typically, the relationship between items of knowledge, attitude, and practice with geo-disaster literacy becomes the basis for recommendations and sustainable practices among Form 3 students around the highlands in the future. Geo-disaster literacy is the basis for changing life practices, especially for

students in Form 3. Literacy among students is essential, such as students in Form 3, to foster a responsible attitude and thus encourage them to love the environment. A high level of knowledge regarding geo-disasters can indirectly shape students' attitudes and practices to be more responsible [2].

The community has been engaging in discussions about the younger generation's knowledge, attitudes, and practices around geo-disasters through various forms of media, such as electronic platforms and newspapers. The problem arises from the view of individuals, particularly students, who possess a limited understanding of various sorts of geo-disasters, such as landslides and mud floods, and the consequential impacts that these calamities can have. As per the Malaysian Education Development Plan 2015-2025 [3], the youth in Malaysia possess a comparatively limited understanding of geo-disasters in contrast to industrialized nations like the United States, Japan, China, Denmark, and others.

Ahmad et al. [4] conclude that the respondents' knowledge of environmental problems or potential geo-disasters is at a level that they cannot be proud of very worrying. The respondent's attitude towards environmental problems or potential geo-disasters is still at a low level because the overall mean is at a low level. The findings were supported by Ibrahim [5], who concluded that the community's environmental knowledge is very good but was not practiced daily.

Furthermore, the local community's practice toward the environment is still low, evidenced by the low mean value [4]. This situation is supported by Dato et al. [6], stating that respondents have a moderate level of environmental knowledge, knowledge of recycling materials, and environmental care practices. The level of community knowledge and practices towards the environment does not reach a worrying level. Nevertheless, knowledge and good practices towards the environment are important for creating a prosperous environment [7]. This situation shows that the community is still unaware of the environment, which can lead to environmental issues or a potential geo-disaster.

2. BACKGROUND

2.1 Students' knowledge of geo-disasters

Nasir et al. [2] assert that many survey studies show that most students in Malaysia have a high knowledge of the environment. Furthermore, many research findings show that students' knowledge and attitude towards the environment are high or very good [8]. This finding came from Nayan et al.'s opinion [9] that most students know the environment. In addition, according to Chin et al. [10], most students have a high level of knowledge about environmental issues that can lead to geo-disasters; however, this is no longer practical.

In the meantime, according to the statement issued by Ajzen [11], knowledge is the foundation that builds blocks in the structure of human thought. Accordingly, knowledge is also considered a cognitive component. In addition, the determination of attitude, intention, and behavior depends on the knowledge that a student has. Exposure to new information can increase a student's knowledge. Increased knowledge causes behavioral changes; when a person has more knowledge, this knowledge will cause them to change their attitude towards a more positive direction towards the environment, which in turn can reduce the potential of geo-disaster. The more often a person is exposed to a message, the more likely a student can be influenced by the message. Attitudes are influenced by cognitive aspects, which consist of knowledge and beliefs about specific information or issues—for example, feelings of love and affection [5].

According to Olson and Zanna [12], a message with an emotional element can influence a person's emotions and feelings towards an issue or information and cognitive elements that tend to act in a certain way. Olson and Zanna [12] also stated that the thinking process (cognitive) affects the way a person acts on the problem or information they learn. This situation is confirmed by the opinion of Mahat [13], who asserts that knowledge is important in helping people see their environment more clearly. In the context of students' knowledge of geo-disasters, when seeing a message about preserving and conserving the environment reduces the potential for geo-disaster phenomena, the information will influence how a student thinks. Furthermore, Cottrell and Gracefe [14] support this idea by stating that knowledge is important to increase attitudes and practices to reduce geo-disasters' potential.

2.2 Student attitudes towards geo-disasters

Information Science and Technology Center (MASTIC) specifies that environmental awareness is increasing,

primarily related to student knowledge and attitudes. A study by Ahmad et al. [4] concludes that more people adopt attitudes that can benefit the environment and reduce the potential of geo-disasters. This situation is in line with the opinion of Mahat [13], who thinks that most students are highly aware of the environment. Human attitude can be explained by Mahat [13] as a human tendency to act consistently towards an object or situation. The tendency refers to how people react to the message or knowledge they acquire. According to Doob [15], a person's actions result from learning either by compulsion or by itself. This is also linked to the cognitive component of feelings or psychological reactions. Knowledge is important to understand psychological action because it determines a person's attitude towards something [1, 2, 13].

Mahat [13] stated that attitudes are formed when someone looks at something with full attention. For example, posters about geo-disaster prevention found in the mass media or print media are examples of such actions. Posters that contain knowledge can form an attitude in a student and will eventually form a more positive action. In addition, according to Nayan et al. [2], the more often a student is exposed to a message related to geo-disasters, the more likely they will be influenced by the message. Campaigns can have good or bad effects. A behavior change will come from a change in one's perspective. This happens when human behavior is related to attitude. Human action is indirectly affected by a change in attitude. Mahat [13] supports this idea by stating that increased knowledge causes behavior to change more positively. Ibrahim [5] also supports this statement that increasing knowledge will cause changes in attitude and behavior. In short, the attitude towards the environment to reduce the potential of geo-disasters depends on the message, which gives us a choice of whether to act positively. When someone sees a geo-disaster prevention campaign, it is very likely that they have the potential to change their attitude and can change in a positive direction or vice versa.

2.3 Student practice against geo-disasters

Practice is also known as a person's rehearsing behavior repeatedly, which is determined based on their knowledge level. When people have a high level of knowledge about geo-disasters, they tend to engage in actions that help reduce the likelihood of these disasters. In contrast, behavior refers to an individual's actions and conduct within their immediate surroundings. This is corroborated by the assertion of Kaliyaperumal [16], who posits that practice is a concept that pertains to the demonstration of knowledge through one's activities. Kaliyaperumal [16] states that the level of practice obtained when a person understands knowledge more deeply allows them to take better actions to create a level of literacy against geo-disasters. If a person's knowledge increases, their attitudes and practices will also change positively. Nayan et al. [2] stated that high involvement in a situation causes positive attitudes and behavior (practice).

Once an individual acquires knowledge, the practice is known as the behavior performed. Previous researchers have found that practice and knowledge are related [17]. The relationship between knowledge and practice suggests that acquiring knowledge can lead to a more positive attitude and acting on what they know. For example, when people are exposed to geo-disaster knowledge, they will know more and positively shape their attitudes and practices. Accordingly, when a person acquires more knowledge, their attitude will

change to be more positive, and their practice (behavior) will also change according to what they know.

2.4 Theoretical approaches and models

The KAP model stands for Knowledge, Attitude, and Practice. Other researchers prioritizing knowledge as a shaper to behavior have made this change [13]. This study uses this approach to understand and measure changes in knowledge, attitudes, and practices of individuals or groups regarding geo-disasters that have occurred in the Cameron Highland district. This model is often used in health, education, and behavior change contexts to evaluate the impact of interventions or education on the understanding, views, and actions of individuals or communities. The KAP model can help understand this study and assess the relationship between knowledge, attitude, and practice. The KAP model measures the respondent’s knowledge by assessing the extent to which individuals or groups completely understand a particular topic or issue [2, 13, 16]. According to the KAP model, perspective change is caused by an individual’s understanding of a matter. In addition, a change in perspective leads to a change in a person’s attitude or practice. This model consists of three main parts: knowledge, attitude, and practice, which serve as the basis of the KAP model. Based on this model, knowledge is the basis for determining attitudes and practices. Mahat [13] and Nayan et al. [1] stated that knowledge is the basis of a person’s feelings and actions. One can increase one’s knowledge through exposure to new information through talks, classes, media, and lectures, among other rational activities.

The theory of Reasoned Action (TRA) is a psychological framework designed to explain and predict human behavior based on two main factors: attitudes toward behavior and subjective norms. In other words, a theoretical framework used to understand and predict human behavior, especially in the context of social decisions. Fishbein and Ajzen [18] developed this theory in the early 1960s. This theory was later updated into the Theory of Planned Behavior (TPB). The essence of TRA is an individual’s belief in a decision or decision related to a particular behavior. According to TRA, a person’s behavior is influenced by the intention to perform the behavior. Even acquiring knowledge does not necessarily lead to a change in attitude, nor does it necessarily lead to action [19]. Two main factors, namely attitude, influence this intention. Attitude is an individual’s belief, whether positive or negative. The second factor is a subjective norm. Meanwhile, subjective norms are related to an individual’s perception coming from important people as social pressure in lives and the extent to which individuals care about other people’s views of their behavior. By measuring subjective attitudes and norms, TRA makes it possible to predict and explain individual intentions, which are then linked to actual behavior.

The TPB is linked to a way for psychologists to think and guess how people will act [11]. It came from the TRA Theory by Martin Fishbein and Icek Ajzen in 1967. TPB focuses on the purpose by seeing the most important thing: to tell if someone will do a particular behavior [11]. This purpose is affected by three main things in TPB: how someone feels about behavior, subjective norms, and the ability to control behavior. Attitude towards behavior is how a person sees and judges the behavior that will happen, whether good or bad. The next type of norm is subjective norms, which are social pressures or opinions that matter to a person, such as their

standards and views on behavior. Last, behavioral control is a person’s belief in their ability to do the behavior correctly. Things like skills, funding, and expected barriers are part of this. TPB also stresses the significance of expected behavioral control factors, including how people feel about their control or power over certain behaviors [20].

The Behaviour Predictor Model, also known as the Predictor of Environmental Behaviour (PEB) Model, helps us determine what makes people act in certain ways in their surroundings [21]. This model is meant to help you understand why some people do things that help protect the world. This model includes how people feel about the world, what they know about it, social norms, and controlling their behavior. Attitude towards the Environment is how someone feels about environmental problems and how interested they are in doing things that are good for the environment. Next, environmental information is how much a person knows about environmental problems and how their actions affect the environment [22]. Social norms also include the expectations and views of social groups, family, or friends that affect how people act in their surroundings.

3. METHOD

This study applies a quantitative method with a survey instrument to measure the level of literacy towards geo-disasters. The population comprises Form 3 students at SMK Sultan Ahmad Shah, SMK Ringlelet, and SMK Kg. King. Only three secondary schools reside in Cameron Highlands. Cameron Highland was selected as a research area due to significant occurrences of geo-disaster, either fast flooding or landslides. These form 3 student was selected to identify the level of knowledge, attitude, and practice towards geo-disasters who are, on average, 15 years old. This study will use simple random sampling to allow everyone to be selected as a sample. The sample size was obtained using the Krejcie and Morgan technique [23]. The total sample is 327 respondents out of 462 students. Table 1 shows the distribution of total respondents according to school.

The questionnaire as a research instrument passed the validity content by three experts: lecturers from the Department of Geography and Environment and the Faculty of Humanities, who reviewed and confirmed the items involved. The reliability test was measured using Cronbach’s alpha value to determine the consistency of the items—a high Cronbach Alpha value of 0.928. The construct of knowledge, attitude, and practice towards geo-disasters is of high value. The analysis involved descriptive analysis, ANOVA, and correlation.

Table 1. Sample size distribution

School Names	Population	Sample Size
SMK Sultan Ahmad Shah	202	132
SMK Ringlelet	140	103
SMK Kampung Raja	120	92
Total	462	327

4. RESULTS AND DISCUSSION

4.1 Student geo-disaster literacy level

Table 2 shows the mean score value for each construct.

Most of the question items have a high mean score. It was found that out of 15 questions, items were presented to the respondents. The lowest mean recorded was S9 (attitude, mean=2.09, SP=1.45). The overall mean score for the attitude construct is high (mean=3.90, SP=1.97). This high value is supported by the findings of a study conducted by Ahmad et al. [4], which stated that more people adopt attitudes that can benefit the environment and further reduce the potential of geo-disasters. It is also similar to the findings by Ibrahim [5] and Mahat [13], who stated that most students are highly aware of their environment. This situation shows that Cameron Highland students have a high attitude about geo-disasters.

Table 2 also shows a high practice construct (mean=4.24, SP=2.06). Most of the question items have a high mean score. This result shows that the students here have a high level of practice regarding geo-disasters. Out of 10 question items presented to the respondents, question item A4, a statement related to ensuring that the surrounding river is well maintained to avoid clogging, recorded the highest mean score (practice, mean=4.41, SP=2.1). The lowest mean is in item A1 (practice, mean=3.99, SP=2.00). Item A1 has recorded the lowest mean compared to the other question items but is still at a high level according to the mean scale above the value of 3.81. The finding of a high mean score for practices against geo-disasters is supported by a study conducted by Choukolaei et al. [17], who stated that the behavior domain scores of male and female students were higher. Valente et al. [24] stated that positive practices result from high involvement in a situation. This situation shows that the form 3 students of three schools in the Cameron Highland district have a high level of practice regarding geo-disasters.

Table 2. Mean score and level of the constructs

Construct	Mean Score	Standard Deviation	Level
Knowledge	4.34	2.08	High
Attitude	3.87	1.97	High
Practice	4.24	2.06	High

*Score indication score means: 0.00-2.49 (Low), 2.50-3.49 (Moderate), 3.50-5.00 (High)

Table 2 shows the value of the attitude construct that shows a high mean score (mean=3.87, SP=1.97). Most of the respondents have a high level of attitude towards the geo-disaster that happened in Cameron Highland. This finding is supported by the Information Science and Technology Research Center (MASTIC) [25], which states that awareness about the environment, especially related to student knowledge and attitudes, is increasing. Ahmad et al. [4] state that more people adopt attitudes that can benefit the environment and reduce the potential for geo-disasters. This situation aligns with the opinion of Hanifah [13] and Nayan et al. [2], who think that most students are highly aware of the environment. Next, a study conducted by Nurjanah and Mursalin [26] states that a positive attitude towards the environment is based on knowledge about geo-disasters in individuals. This is proven by research that as many as 63.41% of students know landslide disasters in the very good category [26]. Ibrahim [5] supports this idea by stating that increased knowledge causes behavior to change more positively. Chin et al. [10] also support this statement that increasing knowledge will cause changes in attitude and behavior.

The value of all three constructs is high, indicating that the literacy of form 3 students in Cameron Highlands secondary schools is high regarding geo-disasters. This is illustrated by

most respondents having a high level for all constructs. This finding aligns with other researchers, such as Bikar et al. [27], who stated that a high level of knowledge and readiness can form a society responsible for the environment. Kaliyaperumal [16] states that the level of practice obtained when a person understands knowledge more deeply allows them to perform better actions. If a person's knowledge increases, their attitudes and practices will also change positively. Valente et al. [24] stated that high involvement in a situation causes positive attitudes and behavior (practice).

Mahat [13] asserts that there are many survey studies that state that most students in Malaysia have a high knowledge of the environment. Nasir et al. [1, 2] state that increased knowledge causes behavioral changes. This statement is also supported by Valente et al. [24], who asserts that when a person has more knowledge, this knowledge will cause them to change their attitude towards a more positive direction towards the environment, which in turn can reduce the potential of geo-disaster. Furthermore, many research findings show that students' level of knowledge and attitude towards the environment is at a high level and can be said to be very good [1, 2, 8]. This result also aligns with the opinion of Ibrahim [5], who states that most students are aware of the environment.

4.2 Differences between student literacy levels

The results of the one-way ANOVA analysis show a difference between the construct of knowledge and attitude at $F=6.372$, $P=<0.001$. The significance level of $P=<0.001$ is smaller than the significance value of $p>0.05$. According to Mahat [13] and Ibrahim [5], the level of in-depth knowledge about the environment, to some extent, affects students' trust in the environment to reduce the possibility of geo-disasters. A study conducted by Permana [28] also supports this finding, which shows that most people interviewed show a positive interest in the environment to reduce the possibility of geo-disasters. Accordingly, this finding aligns with the opinion of Kollmus and Agyeman [21], who asserted that high knowledge will form students' pro-environmental attitudes. According to a study by Permana [28], environmental knowledge can improve attitudes in the face of geo-disasters. The tendency refers to how people react to the message or knowledge they acquire. This result is supported by Doob [15] and Mahadevan [29]; the actions performed by a person are the result of learning either by compulsion or by itself.

Next, a one-way ANOVA analysis results for the difference between knowledge and practice on geo-disasters at the $F=7.901$, $P=<0.001$, and the significance level $P=<0.001$ is smaller than significant $p<0.05$. This finding is consistent with Mahat's [13] opinion, which stated that respondents' level of concern and knowledge will influence how they do things in daily life. In addition, when the concern and knowledge about the environment increases, the respondents' practices towards the environment also increase, further reducing the potential for geo-disasters. This situation aligns with the statement of Nayan et al. [1], who stated that being more concerned about the environment means that a person will be more inclined to seek information about the environment and implement practices that can protect the environment, such as recycling. According to a study by Nayan et al. [2], geo-disaster knowledge leads to different practices. This difference is because of the difference in the level of knowledge between the local community and the outside community about natural

disasters, which can lead to different responses. Local communities have their way of controlling their environment for survival.

In addition, the one-way ANOVA result shows a difference between attitudes and practices towards geo-disasters at $F=4.106$, $P<0.001$. The study of Ahmad et al. [4] supports the findings that more respondents who have a positive attitude towards the environment take actions that can reduce geo-disasters. This situation is consistent with the opinion of Dato et al. [6], which stated that students' awareness of environmental issues or geo-disasters has increased. Accordingly, this finding aligns with the findings of Kollmus and Agyeman [21], who asserted that students' pro-environmental attitudes are linearly correlated with their environmental practices, which means that the possibility of geo-disasters can be reduced. A study by Ibrahim [5] and Mahat [13] states that an individual's practice towards the environment depends on knowledge and attitude. The results of the study show that there is a relationship between students' attitudes and practices towards the environment. The student's practice towards the environment is determined by the way or the student's view of the environment. The study results show that the better students' attitudes towards the environment, the better their practices towards the environment. In summary, the student's knowledge and perception level can lead to different practices towards the environment.

4.3 The relationship between student literacy levels

The study's findings answer the third question: the extent of the relationship between the level of geo-disaster literacy among form 3 students in the Cameron Highland area. Spearman's Rho correlation analysis shows a significant positive relationship between knowledge and attitude, but the correlation relationship is low, $r=.406$, $P<.0.001$. A study by Mahat [13] supports this finding, which shows a significant relationship between parents' jobs and how children care for the environment. This situation is also consistent with Ibrahim [5] and Dato et al. [6] statement that good and liberal parents can give birth to children more friendly to the environment than other children. This situation is caused by the parents' responsibility towards them, especially when they are 12. This is due to the need for parents to actively participate in their children's physical, emotional, cognitive, and social development [4]. In addition, Ahmad et al. [4] also state that all aspects of parenting, such as how parents take care of the environment, can affect children's behavior. This is because parents with the discipline to care for the environment and act as an example to their children can form more pro-environmental practices [1]. According to a study by Mahat [13], high knowledge can foster good practices when facing geo-disasters.

Next, the relationship between knowledge and practice shows a positive value, and the correlation is moderate $r=.412$, $P<0.001$. A study by Ibrahim [5] supports this finding, which shows a significant relationship between parents' jobs and how children care for the environment. This situation is also consistent with the statement of Dato et al. [6] that good and liberal parents can give birth to children who are more friendly to the environment than other children. This situation can be caused by the parents' responsibility towards them, especially when they are 12. This is due to the need for parents to actively participate in their children's physical, emotional, cognitive, and social development [28].

Finally, the relationship between attitude and practice has also recorded a positive value, and the correlation relationship is moderate, which is $r=.415$, $p<0.001$. This finding is supported by a study conducted by Abdullah et al. [30], which found a moderate relationship between students' perceptions and their behavior toward the environment. The study supports the findings of Ahmad et al. [4], who stated that most respondents support environmental care, but this practice is less practiced daily. Choukolaei et al. [17] also state that a high level of environmental literacy will influence the practice, willingness, and skills to overcome environmental problems that can lead to geo-disasters. This study states that environmental literacy is very important because these attitudes and practices can encourage responsible behavior toward the environment among students.

5. CONCLUSIONS

This study shows that the knowledge, attitude, and practice of geo-disaster among Form 3 students is high. This is because the item scores for the level of knowledge, attitudes, and practices of geo-disasters among grade 3 students for three schools in the Cameron Highland district show a high level. Therefore, the level of knowledge about students' geo-disasters positively affects students' attitudes and practices. The Malaysian Ministry of Education can use this study to implement improvements in policies and workshops to improve teacher preparedness in the face of geo-disasters. For example, the Department of Education and the Malaysian Ministry of Education can take steps by integrating geo-disasters into other subjects such as Geography, Science, and even language. In addition, the importance of this study for educators is that educators, especially Geography teachers, are agents of imparting knowledge related to natural disasters in the classroom. This is said to be so because various external studies state that the teacher is one of the essential individuals in delivering the education process directly in the classroom. This is because teachers, as agents, provide support to students, parents, and the community during the current phase and hope for recovery after the occurrence of a geo-disaster such as a landslide or flood.

Next, the importance of this study for illiterate people is the disclosure of mitigation about geo-disasters. According to Permana [28], it has been stated that literacy education about geo-disasters needs to be given to illiterate people so that they can prepare to face the challenges of geo-disasters that have the potential to happen at any time. Finally, the importance of this study to the community is to provide information related to geo-disasters to the community. According to the view of Goma et al. [31] stated that information about geo-disasters can not only reveal to the public the latest news or current issues about natural disasters but also that this information can help the public increase awareness of natural disasters, thus reducing the effects of natural disasters.

REFERENCES

- [1] Nayan, N., Mohmadisa, H., Hanifah, M., Yazid, S., Balkhis, N.S. (2020). Youth climate change mitigation practices and adaptation in Malacca State, Malaysia. *Review of International Geographical Education Online*, 10(2): 58-71. <https://doi.org/10.33403/rigeo.545819>

- [2] Nayan, N., Mahat, H., Hashim, M., Saleh, Y., Norkhaidi, S.B. (2020). Climate literacy awareness among preservice teachers in Malaysia. *Cakrawala Pendidikan*, 39(1): 89-101. <https://doi.org/10.21831/cp.v39i1.26873>
- [3] Ministry of Education Malaysia (KPM). (2015). *Pelan Pembangunan Pendidikan Malaysia 2013-2025*. Malaysia, Putrajaya. <https://www.moe.gov.my/storage/files/shares/Dasar/PP/PM/Pelan%20Pembangunan%20Pendidikan%202013%20-%202025%20Prasekolah%20-%20Lepas%20Menengah.pdf>.
- [4] Ahmad, J.H., Mustafa, H., Abd Hamid, H., Wahab, J.A. (2011). Pengetahuan, sikap dan amalan masyarakat Malaysia terhadap isu alam sekitar. *Akademika*, 81(3): 103-115. <http://journalarticle.ukm.my/3654>.
- [5] Ibrahim, M.T. (2022). Pengetahuan dan amalan pemuliharaan alam sekitar masyarakat Islam Negeri Selangor: kajian program kitar semula. Doctoral Dissertation. Universiti Teknologi MARA (UiTM), Malaysia.
- [6] Dato, J., Mahat, H., Hashim, M., Saleh, Y. (2020). Pengetahuan dan amalan penjagaan alam sekitar dalam kalangan pelajar pra-sekolah. *Akademika*, 90(1), 3-13. <http://journalarticle.ukm.my/15369/1/19510-125424-1-PB.pdf>.
- [7] Sellmann, D., Bogner, F.X. (2013). Effects of a 1-day environmental education intervention on environmental attitudes and connectedness with nature. *European Journal of Psychology of Education*, 28: 1077-1086. <https://doi.org/10.1007/s10212-012-0155-0>
- [8] Shohid, N.I.M. (2022). Pengetahuan, kesedaran dan kesediaan pelajar menengah rendah SMK yan terhadap isu banjir di yan, kedah. *Geografi*, 10(2): 99-122. <https://doi.org/10.37134/geografi.vol10.2.6.2022>
- [9] Nayan, N., Hashim, M., Saleh, Y., Mahat, H., Luyan, M. H., Juanis, J., Khotimah, N. (2022). Schools traffic noise pollution levels along federal roads in Muallim District, Perak, Malaysia. In *IOP Conference Series: Earth and Environmental Science*. 975(1): 012009. <https://doi.org/10.1088/1755-1315/975/1/012009>
- [10] Chin, Y.S.J., De Pretto, L., Thuppil, V., Ashfold, M.J. (2019). Public awareness and support for environmental protection-A focus on air pollution in peninsular Malaysia. *PloS one*, 14(3): e0212206. <https://doi.org/10.1371/journal.pone.0212206>
- [11] Ajzen, I. (2005). *Attitudes, Personality and Behaviour*. McGraw-hill Education, New York, America.
- [12] Olson, J.M., Zanna, M.P. (1993) Attitudes and attitude change. *Annual Review of Psychology*, 44: 117-154. <https://doi.org/10.1146/annurev.ps.44.020193.001001>
- [13] Mahat, H. (2014). Kesedaran Dan Komitmen Pendidlkan Pembangunan Lestari Dalam Komuniti Sekolah Menerusi Program Sekolah Lestari DImalaysia. Doctoral Dissertation. Universiti Pendidikan Sultan Idris, Malaysia.
- [14] Cottrell, S.P., Graefe, A.R. (1997). Testing a conceptual framework of responsible environmental behavior. *The Journal of Environmental Education*, 29(1): 17-27. <https://doi.org/10.1080/00958969709599103>
- [15] Doob, L.W. (1967). *The behavior of Attitudes*. In *Attitude theory and measurement*. New York, John Wiley & Sons.
- [16] Kaliyaperumal, K.I.E.C. (2004). *Guideline for conducting a knowledge, attitude and practice (KAP) study*. AECS Illumination, 4(1): 7-9. <https://cir.nii.ac.jp/crid/1370017282421860743>.
- [17] Choukolaei, H.A., Ghasemi, P., Goodarzian, F. (2023). Evaluating the efficiency of relief centers in disaster and epidemic conditions using multi-criteria decision-making methods and GIS: A case study. *International Journal of Disaster Risk Reduction*, 85: 103512. <https://doi.org/10.1016/j.ijdrr.2022.103512>
- [18] Fishbein, M.A., Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Addison-Wesley, Reading, America.
- [19] Ridener, L.R. (1997). University students' attitude to the environment: An Australian/USA comparison and the effects of an educational program. *Australian Journal of Environmental Education*, 13: 77-84. <https://doi.org/10.1017/S081406260000286X>
- [20] Syazalie Hirman Ahmad Najib. (2022). Hubungan antara niat dan tingkat laku dalam teori Tingkah laku terancang (theory of planned behaviour: TPB): Analisis menurut perspektif islam. In *Proceeding Persidangan Antarabangsa Sains Sosial dan Kemanusiaan ke-7*. Kolej Universiti Islam Selangor. Bandar Seri Putra, Malaysia. pp. 1425-1432.
- [21] Kollmuss, A., Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3): 239-260. <https://doi.org/10.1080/13504620220145401>
- [22] Isa, N.K.M. (2016). Sustainable campus and academic staffs awareness and behaviour in Malaysia's institutions of higher learning: A case study of UPSI. *Geografia*, 12(6), 89-99. <http://journalarticle.ukm.my/10315/1/10x.geografia-siupsi-mei16-Nor%20Kalsum-edam.pdf>.
- [23] Krejcie, R.V., Morgan, D.W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3): 607-610. <https://doi.org/10.1177/001316447003000308>
- [24] Valente, T.W., Paredes, P., Poppe, P.R. (1998). Matching the message to the process: The relative ordering of knowledge, attitudes, and practices in behavior change research. *Human Communication Research*, 24(3): 366-385. <https://doi.org/10.1111/j.1468-2958.1998.tb00421.x>
- [25] Official Portal MASTIC. (1998). *Public Awareness of Science and Technology (STI) Malaysia 1998*. <https://mastic.mosti.gov.my/sti-survey-content-spds/public-awareness-sti-malaysia-1998>.
- [26] Nurjanah, S., Mursalin, E. (2022). Pentingnya mitigasi bencana alam longsor lahan: Studi persepsi mahasiswa. *Jurnal Basicedu*, 6(1): 515-523. <https://doi.org/10.31004/basicedu.v6i1.1937>
- [27] Bikar, S.S., Rabe, Z., Rathakrishnan, B. (2021). Analyze the conceptual understanding of earthquakes among geography teachers in Ranau, Sabah. *Review of International Geographical Education Online*, 11(2): 429-448. <https://doi.org/10.33403/rigeo.780909>
- [28] Permana, I.Y. (2022). Pendidikan keaksaraan dasar literasi mitigasi bencana. *Jurnal Akrab (Aksara Agar Berdaya)*, 13(1): 18-27.
- [29] Mahadevan, K. (2009). Knowledge, attitude and willingness to adopt environmentally responsible behaviours: A survey among students of Universiti Sains

- Malaysia. MA Tesis. Universiti Sains Malaysia, Malaysia.
- [30] Abdullah, N.H.L., Shafii, H., Wee, S.T. (2013). Pengetahuan murid dan perkaitan ibu bapa terhadap kesedaran alam sekitar: Satu kajian awal. *Sains Humanika*, 64(1): 51-57. <https://sainshumanika.utm.my/index.php/sainshumanika/article/view/7/5>.
- [31] Goma, E.I., Rahman, A., Kusumawati, D.A., Nisak, E.C., Suriani, L., Purba, N., Awaliyah, N. (2021, December). Pentingnya literasi media bencana alam bagi masyarakat umum. In *Prosiding Seminar Nasional Pendidikan Matematika, Sains, Geografi, dan Komputer*, pp. 141-144). <https://doi.org/10.30872/msgk.v2i1.764>