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Evaluating the influence of climate change knowledge on intention towards pro-environmental behavior

Mee Yeang Chan, Lilia Halim, Nurfaradilla Mohamad Nasri
Faculty of Education, Universiti Kebangsaan Malaysia, Bangi, Malaysia

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ABSTRACT

Pro-environmental behavior is essential for mitigating climate change, with climate change knowledge often considered a prerequisite for fostering intentions toward such behaviors. However, the specific types of climate change knowledge that most effectively promote pro-environmental behavior remain unclear, indicating a need for further investigation. This survey was conducted among 308 randomly selected Form Two students (average age 14) to respond to a questionnaire consisting of 24 items. The study aimed to explore the relationship between various types of climate change knowledge and students' intention to engage in pro-environmental behavior. Using SPSS version 25.0 software, both descriptive and inferential analyses (correlation and multiple regression) were conducted. Findings revealed that students had the highest level of knowledge regarding mitigation actions, followed by knowledge of the causes and impacts of climate change respectively. All three types of knowledge were significantly and positively correlated with the intention to engage in pro-environmental behavior. Regression analysis showed that students' knowledge on mitigation actions influence the most to the intention compared to the other types of climate change knowledge. The study recommends enhancing students' understanding of the causes of climate change, which could, in turn, improve their knowledge of impacts and better guide their mitigation actions, ultimately fostering higher levels of pro-environmental behavior.

Corresponding Author:

Mee Yeang Chan
Faculty of Education, Universiti Kebangsaan Malaysia
Bangi, Selangor, Malaysia
Email: P97110@siswa.ukm.edu.my

1. INTRODUCTION

The impacts of climate change pose significant global risks, particularly affecting developing countries across various sectors. The main cause of climate change is human activities, particularly the emission of greenhouse gases (GHGs), such as carbon dioxide [1]. Research indicates that a lack of public awareness about climate change is leads to a reduced adoption of environmentally friendly behaviors [2]. UNESCO's sustainable development goals (SDGs) underscore the importance of global citizenship education and sustainable development in the fight against climate change [3].

Climate change knowledge is a key factor in the successful implementation of environmental education programs since it plays a significant role in promoting pro-environmental behavior [4]. However, research suggests that there is a lack of a strong link between climate change knowledge and pro-environmental behavior, nevertheless, at the same time, there is evidence that increased knowledge can promote environmentally responsible behavior [5]. Furthermore, studies have found that a lack of clarity about the specific types of knowledge that influence pro-environmental behavior may lead to the lack of

connection between knowledge and intention to behave environmentally [6]. While researchers highlighted the significance of general climate change knowledge, others advocate for the relevance of knowledge about causes, impacts, and action plans in the context of climate change [7]. This distinction underscores the need for further investigation into the particular kinds of climate change knowledge that are most strongly linked to pro-environmental behaviors. Thus, this research aims to address the following questions:

i) What is the level of climate change knowledge and intention towards pro-environmental behavior?
ii) What is the association between the type of knowledge and the intention towards pro-environmental behavior?
iii) What is the contribution of climate change knowledge on the intention towards pro-environmental behavior?

This study helps in identifying the specific types of climate change knowledge that most significantly influence pro-environmental behaviors. This research gap presents an opportunity to inspect the complex relationship between the types of climate change knowledge and their influence on individual behaviors. Hence, it provides valuable insights for policymakers, educators, and environmental practitioners, offering opportunities to develop educational programs in promoting early awareness of pro-environmental behavior.

2. LITERATURE REVIEW

2.1. Climate change knowledge

Successful efforts to address climate change require appropriate knowledge, skills, and behavioral change, which can be effectively facilitated through education [8]–[10]. Climate change knowledge is important for the people's willingness to change their behavior [11]–[13]. In many countries, the primary focus of climate change education is on the scientific aspects of climate change [14]. However, knowing about the science concepts underpinning the climate change phenomena, which is often the nature of a science-based curriculum approach to environmental issues, is found to be inadequate and fails to inspire students to engage in pro-environmental activities and action [15]. In other words, while understanding concepts such as the carbon cycle and GHGs is vital, it is equally important to acknowledge that a comprehensive approach to climate change education should encompass more than just science [14]. In short, the knowledge taught in school is emphasizes knowing, and less on knowledge for action [16].

Numerous studies have examined the relationship between general climate change knowledge and pro-environmental behavior among students. Research has shown that individuals with a higher level of knowledge about climate change are more likely to engage in pro-environmental behaviors such as recycling, reducing energy consumption, and supporting environmental policies [6]. This suggests that increasing climate change knowledge among students may lead to positive changes in their environmental attitudes and behaviors. However, research by Shi *et al.* [17] found that not all dimensions of knowledge are equally influencing the intention toward pro-environmental behavior. Cognitive psychologists have outlined three knowledge domains crucial for promoting environmental conservation behavior which comprise knowledge of the climate system, specific knowledge, contextual knowledge, and practical knowledge [18]. On the other hand, knowledge also can be divided into an understanding of the causes and impacts of climate change, knowledge of strategic action, and skills for mitigation [19].

Furthermore, there is no consensus on the studies on which type of climate change knowledge affects pro-environmental behavior among students. For example, research by Liu *et al.* [6] showed the causal climate change knowledge influences the most for a person to adopt pro-environmental behavior. While, research by Frick *et al.* [18] found that grasping the effects of climate change will effectively address these outcomes necessitates a thorough understanding of how to minimize their influence on climate change. Furthermore, other research also showed that knowledge on the potential strategies for behaving in an environmentally conscious manner, as awareness of mitigation measures can influence their willingness to adopt pro-environmental behavior [18], [20].

In addition, previous research showed that knowledge that gives direct experience plays a crucial role in environmental education by enabling students to connect theoretical concepts with real-world actions and activities [21]. Hence, when students engage directly with their environment, such as through field trips, hands-on projects, or community service, they develop a deeper understanding of environmental issues and their personal impact on these issues [22]. Research has shown that direct experiences in nature significantly enhance environmental attitudes and behaviors, making students more likely to adopt and sustain pro-environmental behavior [21].

2.2. Intention towards pro-environmental behavior

Several conceptual frameworks have emerged to elucidate the disparity between environmental consciousness and actual pro-environmental conduct [23]. Established theories such as altruism, empathy,

and pro-social behavior, along with sociological models, have been employed to comprehend the factors influencing actions that endorse environmental preservation. Additionally, significant focus has been placed on the theory of planned behavior (TPB) [24]–[26] and the value-belief-norm (VBN) model [27], [28] for their capacity to forecast support for environmental initiatives.to elucidate the discrepancy between environmental consciousness and actions that support the environment [23].

Bergquist *et al*. [29] proposed that suitable interventions for addressing climate change focus on promoting environmentally friendly behaviors to minimize harm to the environment. Encouraging the implementation of pro-environmental behavior is essential in combating climate change, particularly among students who possess the capacity to make a significant impact [16], [30]. In another word, by embracing sustainable behaviors and enhancing consciousness about ecological issues, students can aid in the reduction of carbon emissions and the conservation of natural resources [31].

An effective approach for students to advocate for pro-environmental conduct is by integrating sustainable routines into their daily lives [32]. This can encompass the preservation of energy by turning off lights and electronic devices when not being used [33], utilizing public transportation or carpooling to minimize vehicle emissions, and decreasing waste through recycling and composting efforts [34], [35]. Taddicken *et al.* [36] suggested classifying these behaviors based on factors such as location, individual traits, specific issues, repeatability, and impact. After considering the categories of types of behavior as suggested, the pro-environmental behavior targeted in this study focuses on the mitigation of climate change by reducing the release of carbon dioxide gas [30] that can be practiced among the Form Two students (average age 14 years old). Hence, the targeted behavior encompassed electrical energy-saving behavior, water savings behavior, and recycling used materials.

3. METHOD

3.1. Research design and sampling

This research employs the survey method through simple random sampling of students from the southern states of Peninsular Malaysia. The survey was conducted on 18th July 2021 for two weeks. A total of 308 Form Two students (average aged 14) participated in the survey. The G-Power calculation [37] has indicated that a minimum of 222 participants is required for this study. Conducting a power analysis to determine the necessary sample size will show whether the obtained results are statistically significant. Prior to the survey, approval from the Ministry of Education Malaysia was obtained (approval letter KPM.600-3/2/3-eras (10698)). The participants were asked for consent before data collection.

3.2. Instrument

The main advantage of confidence assessment in education is its ability to allow students to answer questions with varying levels of confidence, thus enabling both strong and weaker students to feel a sense of accomplishment and work on improving their knowledge gradually [36]. Assessing individuals' understanding of climate change often involves evaluating their level of confidence in comprehending the causes, impacts, and mitigation strategies associated with it [31]. Assessment methods may include testing individuals' knowledge with factual answers, and the development of assessment tools should take into account factors such as validity, content, and complexity [38]. Confidence ratings and Likert-scale agreement ratings are commonly employed to gauge levels of knowledge [36], providing valuable insights into people's comprehension of climate change and their willingness to participate in pro-environmental efforts.

Additionally, confidence assessment helps teachers identify areas where students need more support, allowing for tailored teaching methods to meet individual needs and encouraging students to take an active role in their learning [39]. Despite its limitations, such as suitability for all subjects and the risk of overconfidence leading to inaccurate assessments [39], confidence assessment remains a valuable tool for educators in promoting active engagement and improving academic performance [36]. The questionnaire in this study uses confidence assessment to measure the level of climate change knowledge among students, providing a non-threatening way to test their knowledge and encouraging active engagement in the learning process [39].

This research used a questionnaire containing a total of 15 statements (items) about the causes (five items), the impacts (five items), and the mitigation action of climate change (five items), which are adopted and adapted from nine statements of intention to practice pro-environmental behavior. For each item, students responded by ticking their agreement on the statements based on five Likert scales labeled as 1 (strongly disagree) to 5 (strongly agree) showing their confidence in the statements, as seen in Table 1. All the items in this questionnaire are positive statements [40], as using a mixed format can create threats to the validity and reliability of the instrument [41]. The outcome of the reliability test for internal consistency of the scale for measuring climate change knowledge showed the Cronbach alpha value of .918 and for intention towards pro-environmental behavior showed the Cronbach value of .894.

Table 1. The number of items for each construct and the examples of items in the instrument

Constructs	No. of items	Examples of items
Knowledge about the causes of climate change	5	The causes of climate change are: i) Combustion of fossil fuels (examples: coal, petroleum, and gasoline gas) ii) Use of vehicles
Knowledge about the impact of climate change	5	The impact of climate change is: i) The frequency of hurricane phenomena is increasing ii) The monsoon season occurs earlier and is unpredictable
Knowledge about the mitigation action of climate change	5	The action to mitigate against climate change is: i) Walk or cycle for traveling short distances ii) Practicing electricity saving in daily life
Intention towards pro-environmental behavior	9	i) I will turn off the light switch when leaving the room ii) I will turn off the tap when brushing my teeth

3.3. Data analysis

The responses of the questionnaire were coded to a statistical package for the social science (SPSS) 25.0 data file for analyses. Descriptive analysis, correlation, and regression of the variable, climate change knowledge, and intention towards pro-environmental behavior were analyzed. Descriptive analysis was conducted to address the research question, correlation analysis was applied to examine the second research question, and regression analysis was performed to investigate the third research question.

4. RESULTS AND DISCUSSION

4.1. Descriptive analysis

Descriptive analysis in particular levels of students' knowledge of climate change is displayed in Tables 2-4. The responses on knowledge about the causes of climate change are shown in Table 2, and the response on the impact of climate change is displayed in Table 3. Table 4 shows the extent of students' agreement with the suggested mitigation actions in addressing the impact of climate change.

Table 2. Distributions of respondents of students (n=308) to statements on the causes of climate change

Statements (The causes of climate change)	Strongly disagree n, (%)	Disagree n, (%)	Less agree n, (%)	Agree n, (%)	Strongly agree n, (%)
Combustion of fossil fuels (examples: coal, petroleum, and gasoline gas)	10 (3.2%)	13 (4.2%)	28 (9.1%)	94 (30.5%)	163 (52.9%)
Use of vehicles	2 (.6%)	7 (2.3%)	24 (7.8%)	132 (42.9%)	143 (46.4%)
Excessive use of electrical equipment	21 (6.8%)	31 (10.1%)	109 (35.4%)	93 (30.2%)	54 (17.5%)
Water treatment	54 (17.5%)	65 (21.1%)	91 (29.5%)	73 (23.7%)	25 (8.1%)
Use of plastic bags	22 (7.1%)	42 (13.6%)	71 (23.1%)	103 (33.4%)	70 (22.7%)

Table 3. Distributions of respondents of students (n=308) to statements on the impact of climate change

Statements (The impact of climate change)	Strongly disagree n, (%)	Disagree n, (%)	Less agree n, (%)	Agree n, (%)	Strongly agree n, (%)
The frequency of hurricane phenomena is increasing	22 (7.1%)	41 (13.3%)	81 (26.3%)	115 (37.3%)	49 (15.9%)
The monsoon season occurs earlier and is unpredictable	6 (1.9%)	28 (9.1%)	70 (22.7%)	134 (43.5%)	70 (22.7%)
The frequency of floods, droughts, and forest fires is increasing	9 (2.9%)	8 (2.6%)	36 (11.7%)	136 (44.2%)	119 (38.6%)
The weather is getting hotter	4 (1.3%)	6 (1.9%)	15 (4.9%)	89 (28.9%)	194 (63.0%)
Sea level rise due to the melting of ice at the north pole and south pole	11 (3.6%)	13 (4.2%)	23 (7.5%)	113 (35.7%)	148 (48.1%)

Table 4. Distributions of respondents of students (n=308) to statements concerning the possible mitigation action of climate change

Statements (The mitigation action of climate change)	Strongly disagree n, (%)	Disagree n, (%)	Less agree n, (%)	Agree n, (%)	Strongly agree n, (%)
Walk or cycle for traveling short distances	5 (1.6%)	8 (2.6%)	14 (4.5%)	107 (34.7%)	174 (56.5%)
Practicing electricity saving in daily life	4 (1.3%)	5 (1.6%)	21 (6.8%)	128 (41.6%)	150 (48.7%)
Practicing water conservation in daily life	7 (2.3%)	8 (2.6%)	36 (11.7%)	119 (38.6%)	138 (44.8%)
Practicing recycling	1 (.3%)	6 (1.9%)	10 (3.2%)	93 (30.2%)	198 (64.3%)
Use less paper	9 (2.9%)	11 (3.6%)	37 (12.0%)	122 (39.6%)	129 (41.9%)

The results showed that a high percentage of students (more than 80%) agreed and strongly agreed that the cause of climate change is due to combustion of fossil fuels and the use of vehicles. But they seem to less agree with the statement that the excessive use of electrical appliances (about 40%) and water treatment (more than 68%) will cause climate change. The students are more prone to agree with the statement that they can directly relate to climate change in their daily lives. Actions that are indirectly releasing GHGs as the main cause of climate change are less understood by the students. The use of electrical appliances and water treatment does not directly produce carbon dioxide in massive form. Hence, it is quite difficult for the students to relate the indirect contribution to the release of GHGs to the cause of climate change [21]. Meanwhile, the combustion of fuel and uses of vehicles are directly producing carbon dioxide gas, and this led to many students strongly agreeing with the statement. Therefore, this assertion carries significance within the realm of education, stressing the importance of giving precedence to the correlation between human actions and GHGs emissions. By spotlighting familiar causes, educators can enrich students' understanding of climate change and its ecological repercussions, encouraging more knowledgeable and engaged in pro-environmental behavior [42]. Incorporating real-life instances into the syllabus can cultivate an understanding of the significance of decreasing emissions, nurturing an environmentally aware mentality [21].

Almost half of the students (n=144, 46.7%) less agreed with the statement "The frequency of hurricane phenomena is increasing." This may be due to the fact that hurricanes are not happening in Malaysia and most of the students only seen or heard of the phenomena and its impact on the climate through the media. This is comparable to the statement "The weather is getting hotter" where most of the students agree with the statement (n=283; 91.9%) because they can directly experience it and even affects their daily lives. Hence, this result highlights the significance of practical learning in science education, incorporating field trips, laboratory experiments, and community projects [22]. By integrating practical experiences and dispelling misconceptions, students can be better equipped to comprehend and tackle environmental challenges and later adopt the pro-environmental behavior [43].

Even though the students less agree and disagree that the uses of plastic bags are one of the causes of climate change (Table 2), but 94.5% of the students agree that practicing recycling may help to mitigate climate change (Table 4). A similar trend of agreement is also seen for the statement of using electricity in their daily lives that it may cause climate change (Table 2), but many of the students do agree that practicing electricity saving in their daily lives will help to mitigate climate change (Table 4). This is concurrent with effectiveness knowledge where people address the relative gains and benefits [18]. Students tend to save practice electrical and water saving in their daily lives to help their parents decrease their monthly bills which indirectly contributes to developing mitigation actions for climate change [44]. Hence, it highlights the significant benefits of implementing environmentally friendly practices, such as saving costs, which can deeply impact students [45]. Incorporating real-world examples and practical applications into the curriculum can boost student engagement and retention [21]. By promoting active involvement and fostering an understanding of individual contributions to global results, educators can cultivate a more resolute attitude toward sustainability in students [42].

Table 5 shows that a high percentage of students' intention towards electrical saving behavior (more than 85%) compared to other pro-environmental behaviors. However, the students may adopt the pro-environmental behavior for various reasons that might not be related to the issue of climate change, but due to the civic values and norms that are instilled among them (sustainable activities). This is especially true for the pro-environmental behaviors that are related to costs of electrical and water bills [44], [45]. Most of the students cannot relate the use of excessive electrical appliances and water treatment as the cause of mass production of carbon dioxide that leads to climate change [21], despite having the intention to practice electrical and water-saving behavior.

Another less agreed intention (57.5%) relates to actions of donating or selling unused items for recycling. This action may be caused by the lack of accessibility to recycling collecting and processing centers and exposure to second-hand product markets in the communities. In addition, lack of places for easy collection in the community might hamper the act of donating or sell unused items with the aim of recycling [46]. The secondary school students are ready to adopt mitigate action if the action is convenient and do not affect their major lifestyle changes [47]. Therefore, if the actions necessitate personal effort, these students will be less inclined to engage in environmentally responsible conduct. The implications of these findings are to encourage environmentally responsible behavior among students, educational programs must address the practical barriers to such actions. By making it easier for students to donate or sell unused items, schools can foster a culture of recycling and sustainability [48]. Programs that integrate simple, everyday practices into students' routines can be more effective [49]. For example, schools can set up easily accessible recycling bins and organize regular collection drives. Educators can also highlight the benefits of these actions, such as reducing waste and conserving resources, to motivate students.

Table 5. Distributions of respondents of students (n=308) to statements on the intentions towards pro-environmental behavior

Statements (Intention towards pro-environmental behavior)	Strongly disagree n, (%)	Disagree n, (%)	Less agree n, (%)	Agree n, (%)	Strongly agree n, (%)
I will turn off the light switch when leaving the room	2 (.6%)	6 (1.9%)	32 (10.4%)	91 (29.5%)	177 (57.5%)
I will turn off the tap when brushing my teeth	4 (1.3%)	12 (3.9%)	53 (17.2%)	82 (26.6%)	157 (51.0%)
I will dispose of the trash in the recycling bin properly	18 (5.8%)	24 (7.8%)	75 (24.4%)	78 (25.3%)	113 (36.7%)
I will switch off the fan switch when I leave the room	2 (0.6%)	7 (2.3%)	32 (10.4%)	76 (24.7%)	191 (62.0%)
I will reduce the bathing period to reduce water consumption	8 (2.6%)	20 (6.5%)	82 (26.6%)	117 (38.0%)	81 (26.3%)
I will optimize the use of paper by using both sides of the paper face	10 (3.2%)	14 (4.5%)	45 (14.6%)	108 (35.1%)	131 (42.5%)
I will turn off the television if not watching	4 (1.3%)	21 (6.8%)	48 (15.6%)	80 (26.0%)	155 (50.3%)
I will turn off the shower when soaping	23 (7.5%)	43 (14.0%)	76 (24.7%)	70 (22.7%)	96 (31.2%)
I will donate or sell unused items for recycling purposes	28 (9.1%)	43 (14.0%)	75 (34.4%)	71 (23.1%)	91 (29.5%)

4.2. Association between climate change knowledge and intention toward pro-environmental behavior

Table 6 shows that there is an existence of a significant positive but weak correlation between climate change knowledge and its components with the intention to adopt pro-environmental behavior. Schober *et al.* [50] suggested that the correlation value, r between .10 to .39 is considered a weak correlation. The result shows the correlation between knowledge of climate change with pro-environmental behavior (r=.333, p=.000). On the other hand, the components of knowledge of climate change also show a significant positive correlation with pro-environmental behavior. The knowledge on the causes of climate change (r=.222, p=.000); the impact of climate change (r=.304, p=.000); mitigation action of climate change (r=.378, p=.000). This shows that all the three categories of knowledge of climate change are positively and significantly correlated to pro-environmental behavior.

Thus, it is important to include thorough education on climate change in the curriculum to increase students' understanding and promote pro-environmental behavior. Teachers should instruct students on the scientific aspects of climate change as well as practical ways to mitigate its effects [16]. Studies show that educating students on actionable measures encourages behavioral change. Educational programs should show students the link between their actions and environmental impact, using hands-on experiences to demonstrate the effects of climate change and mitigation strategies' effectiveness [21].

Table 6. Correlation between the knowledge of the causes, the impacts, the mitigation action of climate change with intention towards pro-environmental behavior

	Statistic	Cause	Impact	Mitigation	Knowledge
PEB	Pearson correlation	.208**	.304**	.336**	.333**
	Sum of squares and cross-products	51.280	74.053	75.509	268.479
	Covariance	.138	.199	.203	.722
	N	373	373	373	373

Note: ** Correlation is significant at the .01 level (2-tailed); PEB=pro-environmental behavior

4.3. Multiple regression

The association between the type of knowledge (the cause, the impact, and the mitigation action of climate change) with the intention of pro-environmental behavior towards mitigation of climate change was determined through regression analysis. Assumptions for regression analysis on multi-collinearity were tested and its outcomes were met in which the high tolerance values were from .707 to .813 and VIF were from 1.231 to 1.414. The results show a statistically significant and fit at R^2=.172. In other words, 17.2% of the variance in pro-environmental behavior in mitigating climate change is explained by the model. Table 7 shows that knowledge of the impact and ways to mitigate climate change impact contributed significantly towards the intention to behave pro-environmentally. The result showed that knowledge about the mitigation action of climate change was the best variable contribute the intention of pro-environmental behavior among students (R^2=.172, R_adj^2=.164, F (3,307)=21.11, p<.001).

As Table 7 indicates, the intention towards practicing pro-environmental behavior was predicted, and it was found that the knowledge of the impact of climate change (B=.159, p<.05) and the knowledge of

the mitigation of climate change (B=.334, p<.001) are significant contributors. The knowledge of the causes of climate change (B=.074, n.s) is a non-significant predictor. The result highlights the significance of teaching actionable strategies for reducing climate change that leads students adopt pro-environmental behavior. Effective educational programs should prioritize knowledge on mitigation of climate change and real-life examples to bridge the gap between awareness and action, fostering pro-environmental behavior and responsible students. Ultimately, it is important for the students to gain knowledge on mitigation of climate change for them to have the intention towards pro-environmental behavior. More interventions should be added to increase the knowledge of students about the mitigation actions so that they transfer them into practice. In addition, students should also be educated in terms of the causes of climate change. With such knowledge, the students' mitigation actions will be better informed based on sound knowledge related to the causes of climate change.

The regression analysis aimed to investigate how different factors related to climate change influence individuals' intentions to engage in pro-environmental behavior. The model included three predictors: the impact, the causes, and mitigation efforts of climate change. The overall regression model was statistically significant, F(3,307)=21.11, p<.001, suggesting that these predictors collectively explain a notable portion of the variance in the dependent variable, which is the intention to adopt pro-environmental behavior. The analysis showed that approximately 17.2% of the variance in intentions towards pro-environmental behavior was explained by the model (R^2=.172). The adjusted R^2 value of .164 indicates a good model fit after accounting for the number of predictors, meaning around 16.4% of the variance in the dependent variable is explained by the model.

The regression coefficients revealed that the impact of climate change (B=.159, SE=.065, β=.152, t=2.443, p=.015) and the mitigation of climate change (B=.334, SE=.065, β=.296, t=5.113, p<.001) were significant predictors of the dependent variable. However, the causes of climate change (B=.074, SE=.067, β=.065, t=1.097, p=.273) were not a significant predictor. This implies that a higher level of knowledge of the mitigation efforts is associated with greater intentions to engage in pro-environmental behavior. These results highlight the importance of emphasizing both the impacts of climate change and the effectiveness of mitigation strategies to encourage pro-environmental intentions among individuals.

The findings from the regression analysis indicate that educational initiatives should give priority to teaching effective strategies for addressing climate change. Highlighting proven measures such as the adoption of renewable energy and conservation practices can boost students' willingness to advocate mitigation of climate change. Learning materials ought to feature practical information and real-life case studies demonstrating the impacts of climate change and potential solutions [21].

Table 7. Regression between the knowledge of the causes, the impacts, the mitigation of climate change with intention towards pro-environmental behavior, overall model (n=308)

Variables	Unstandardized coefficients		Standardized coefficients		
	B	SE	Beta	*t*	*p*
(Constant)	1.643	.306		5.362	.000
The impact of climate change	.159	.065	.152	2.443	.015
The causes of climate change	.074	.067	.065	1.097	.273
The mitigation of climate change	.334	.065	.296	5.113	.000
R	.415				
R^2	.172				
Adjusted R^2	.164				
F (3, 307)=21.11 ***					

Note: B=unstandardized regression coefficient; Beta=standardized regression coefficient; SE=standard error of B, *p<.05, ** p<.01, *** p<.001.

5. CONCLUSION

It is evident that a comprehensive knowledge about climate change, including its impacts and mitigation strategies is essential in bridging the gap between knowledge and pro-environmental behavior. Future research in this area could focus on developing and implementing educational interventions that specifically target enhancing students' comprehension of the causes of climate change. This could involve designing curriculum enhancements, educational materials, or interactive learning experiences that effectively communicate the complex scientific concepts related to climate change causation. To achieve this, educational programs should prioritize experiential learning and incorporate practical knowledge and actionable strategies within the curriculum. Furthermore, educators should underscore the significance of individual actions in addressing global environmental challenges and provide the necessary infrastructure to support students in adopting environmentally responsible behaviors. The study also highlights the need for a holistic approach to climate change education, one that goes beyond imparting scientific facts to fostering a

deeper understanding of the consequences of climate change and the effectiveness of mitigation strategies. By integrating climate change education into the broader curriculum and providing opportunities for experiential learning, schools can cultivate a generation of environmentally conscious individuals ready to take meaningful action.

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AUTHOR CONTRIBUTIONS STATEMENT

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Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Mee Yeang Chan	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	
Lilia Halim	✓	✓		✓		✓		✓	✓	✓	✓	✓	✓	✓
Nurfaradilla Mohamad Nasri						✓	✓			✓		✓		

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

INFORMED CONSENT

Informed consent was obtained from all subjects involved in the study.

DATA AVAILABILITY

The data that supports the findings of this study are available on request from the corresponding author, [MYC]. The data, which contains information that could compromise the privacy of research participants, is not publicly available due to certain restrictions.

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BIOGRAPHIES OF AUTHORS

Mee Yeang Chan is a Ph.D. candidate in the Faculty of Education, Universiti Kebangsaan Malaysia and also a chemistry teacher at high school in Malaysia. Her research focuses on climate change education, learning environments, science education, and STEM education. She can be contacted at email: P97110@siswa.ukm.edu.my.

Lilia Halim is a professor in Science Education in the Centre of STEM Enculturation, Faculty of Education, Universiti Kebangsaan Malaysia. Her research interests include understanding science teachers' thinking, climate change education, development of teachers' professional knowledge, namely teachers' pedagogical content knowledge and the design of innovative science teaching and learning. She is also an expert and resource person to various organizations that include Regional Centre for Science and Mathematics Education (RECSAM), WorldWide Fund- Nature, Malaysia and International Association for the Evaluation of Educational Achievement (IEA) Netherlands. She has written practically oriented books for science and physics teachers, co-editor of books about science (teacher) education, articles in local and international referred journals, and article reviewer of various international research journals. She can be contacted at email: lilia@ukm.edu.my.

Nurfaradilla Mohamad Nasri is Senior Lecturer in Curriculum and Pedagogy at the Centre of Educational Leadership and Policy, Faculty of Education, Universiti Kebangsaan Malaysia. She did her Ph.D. at the University of Edinburgh, UK. Her main research interest relates to development of a culturally responsive curriculum and instruction, teachers' professional development, self-directed learning, and sustainable learning. She can be contacted at email: nurfaradilla@ukm.edu.my.