The Effect of Green Practice Activities on the Understanding of Green Technology Topics in the Secondary School Geography Curriculum

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ABSTRACT

This study aims to analyze the levels of, and differences between, the effects of variables related to green practice activities on the understanding of green technology topics in the Form 2 Geography curriculum in Sekolah Menengah Kebangsaan Seri Aman, Johor. A quantitative approach with a survey and questionnaire design was used in this study, which sampled 152 Form 2 and 3 students using a simple random sampling technique. Descriptive analysis (frequency, percentage, mean, and standard deviation) and inferential analysis (t-test and ANOVA) were used to answer the study questions. The findings of the study showed that the high level of effects (M = 3.95, SP = .78). The t-test results showed no significant difference between the effects based on age t (152) = .279, p> .05. The results of the t-test showed a significant difference between the effects based on gender t (152) = .001, p <.05. The results of ANOVA did not show any significant difference between the effects based on the grade obtained in the Geography subject F (2.352) = .057, p> .05. In conclusion, this study shows that students were greatly affected by the impacts of green practice activities. The study also makes recommendations to improve the implementation of green practice activities. The Ministry of Education Malaysia can use this study as a reference and encourage all schools to implement green practice activities so that love for the environment can be applied and the students' understanding of environmental topics, such as green technology, can increase.

INTRODUCTION

Malaysia is currently facing rapid changes, especially regarding economic, political, social and scientific and technological developments (Fazni, 2020), in line with the desire to achieve developed country status. The education system in Malaysia has also been indirectly affected, especially in the subject of Geography. The changing world of education now is

more focused on 21st-century learning (PAK-21), which means teachers must be more creative in diversifying activities to achieve the set objectives. This is because each student has different levels of intelligence related to, for example, verbal linguistics, visual space and interpersonal skills (Suppiah et al., 2015). Thus, applying the chalk-and-talk method in the teaching and learning process is considered less relevant because it only creates a one-way relationship and does not give students the opportunity to think critically and analytically to solve environmental problems.

The purpose of Geography as a subject is not only to introduce various concepts and processes that occur in space but also to educate and cultivate good values in students so they become sensitive to environmental protection (Ministry of Education Malaysia, 2015). This shows the importance of the implementation of green practice activities in the Geography Form 2 curriculum, the topics of which would relate to the environment, such as green technology topics. Teachers are the students' main mentors in the teaching and learning process because the activities implemented can affect the understanding and mastery of a topic (Hanifah et al., 2017). This shows the importance of the role of teachers and activities used when teaching the topic of green technology, the purpose of which is to attract the attention and interest of students so they continue to explore the topic in greater depth.

Teachers can vary the form of presentation, using analogy, illustration, example, explanation and demonstration when they present teaching content. This is especially the case with green technology because the presentation can affect students' understanding of the topic (Mohammad Zohir, 2016). Students' understanding of the green technology topic not only serves to meet the teaching objectives but also to shape more environmentally friendly behaviors. It is clear that exposure to caring for the environment at the school level is an effective way to educate students on, and raise their awareness of, environmental protection. To achieve this goal, this study was conducted to identify the effects of green practice activities on the topic of green technology in the Form 2 Geography curriculum.

LITERATURE REVIEW

Geography curriculum learning

Education in Malaysia is dynamic and open to the current circumstances as well as the changing demands for the future. National education has undergone a series of evaluations by several committees that have been established since 1950, culminating in the Murad Committee, which was established in 2004 to review the need to empower national schools. This indicates that the assessment system is undergoing a continuous process of re-evaluation and review aimed at improving and enhancing the quality of education in the country. The main purpose of evaluation and surveys is to determine the effectiveness of implemented plans, including teaching and learning in Geography (Hanifah et al., 2019).

The issue of teaching and learning Geography in schools and institutions of higher learning has been an ongoing major issue (Nazli, 2009). Functional geographical knowledge refers to the application of geographical skills and those related to problem-solving efforts in the environment. The acquisition of professional qualifications and related skills in Geography

equips a person for future self-employment and related business opportunities (Samuel et al., 2014). Moreover, with the advancement of science and technology, the field of Geography continues to evolve in line with human needs worldwide. However, in Malaysia, the situation has changed since Geography gained full status as an elective subject in 1993 (Chuah, Wan Rozali, & Joseph, 2013). Since then, Geography as a subject has been isolated in the Malaysian education system, a situation which has influenced institutions of higher learning. Nevertheless, various measures have been and are being taken by Geography education practitioners to attract students through the use of various teaching and learning methods in this subject.

Green practices among students

Green practices are environmentally friendly activities that contribute to the formation of individuals who see themselves as responsible for protecting the environment and conserving natural resources for present and future generations. The green practices outlined by KeTTHA cover six criteria, namely energy saving, water saving, and the 3R practices of using environmentally friendly products, cafeterias and transportation (KeTTHA 2015). In the context of green practices used in schools, Stone's (2009) study argues that these cover a broad set of pro-environmental actions related to designing, guiding and managing more sustainable school buildings. The practices comprise school-based individuals who are able to address social and economic aspects, as well as the school environment. Initiatives taken often involve reductions in energy consumption, water consumption and waste production; the purchase of sustainable products and cleaning services that use non-toxic detergents; recycling; and ensuring school buildings follow green building standards.

The studies of Braithwaite (2014) and Bates and Tregenza (2007) revealed that a positive impact arises outside the school environment when children are exposed to the 3R practice activities, as the attitudes and knowledge gained are also shared with family members at home. However, the findings of previous studies revealed that the level of awareness of green practices among children in Malaysia is still not commendable. For example, a study by Hanifah and Muhamad Suhaily Yusri (2016) involving a sample of 500 pre-school students in the district of Hulu Langat, Selangor revealed that the sustainability practices of these students were at only a moderate level. Hanifah's (2013) study of 500 students revealed that their knowledge and practices of sustainability were not aligned, that is, students had a high level of knowledge regarding environmental sustainability but the level at which this was practiced remained moderate. The findings of this study correspond with those of Saravanan et al. (2013), who identified that the level of sustainable consumption practices among 354 students in Kluang Johor was moderate. His study concluded that students have not yet reached a level of sustainable consumption practices that could help preserve and conserve the environment now and in the future.

The Effect of Activities on Student Comprehension

The role of education as a basis for achieving an improved quality of life in general is widely known. Education is also an important medium for increasing human knowledge and awareness of the planet and the environment (Nurul Hidayah et al. 2013). In order to achieve

the goals of education, various ways and methods can be used, including conducting activities that attract students' interest in, and understanding of, each subject. In the study of Monica Laina and Zamri (2020) regarding the impact of project-based learning of the Malay Language subject among primary school pupils, it was found that teachers often used acronyms to help students write essays. However, the use of such techniques has less effect on students' comprehension of how to write essays. Therefore, the availability of more open learning, such as project-based learning, has helped primary school students to write essays through the use of scrapbooks. The study findings showed that primary school students could express the main ideas well, clearly and in an organized manner. This is because, through scrapbooks, the students needed to collect and analyze all the information obtained from various sources. Constructing a scrapbook can also increase students' interest in writing English because they would be given the opportunity to express their creativity while completing the task. This clearly shows that performing scrapbook construction activities affects the cognitive, psychomotor and affective aspects of students, thus influencing their understanding.

The introduction of activities can be implemented at various times during a learning period. The implementation of activities in a co-curriculum has a positive effect on student engagement (Mohd Fazli et al. 2013). In fact, administrators, namely school principals, can play a role by encouraging teachers and students to implement better structured co-curricular activities (Mohd Izham & Norziana 2015). A study by Lezah and Rosy (2018) on the effect of Gallery Walk activities on the understanding of pre-university History students showed that such activities increased students' understanding of this subject. Gallery Walk activities create various interactions within the teaching and learning process. Two-way interactions between students and students, as well as between students and teachers, took place during the Gallery Walk activity implemented in the classroom. This helped students gain a considerable amount of information, as well as views from classmates, when the activity was followed by 'question and answer' and debate methods. The implementation of such approaches clearly showed that activities involving various interactions can positively affect students' understanding of the subject of History.

In addition, practical or hands-on activities are also methods of improving students' understanding in a subject. Yang's (2015) study of Form 1 students in Selangor showed that their performance and understanding of project-based learning increased when it was used in the subjects of Integrated Living Skills and Communication Skills. Project-based learning has been introduced to replace traditional learning methods that focus on chalk-and-talk. The use of project-based learning methods can help students understand a topic in greater depth because they are actively involved in the teaching and learning process. This can be demonstrated through collaborative activities and collaboration between group members to complete a given task. Project-based learning can be implemented while teaching the topic of the design and production of wood products with Form 1 students. Through this method, students themselves are given the freedom to design projects, solve problems, analyze and make justifications. The findings of this study clearly showed that project-based learning

stimulated students' cognitive functions so that they understood better the topic of designing and producing wood products.

METHODOLOGY

The design of this study was survey-focused. The survey method aimed to reveal more clearly and in detail the implementation and impact of green practice activities. This study used a quantitative method of a questionnaire to analyze the data. Questionnaires were distributed to Form 2 and 3 students at SMK Seri Aman, Kota Tinggi. The data collection process in this study is current because it could be collected in a short time.

There are 22 secondary schools in the Kota Tinggi district. However, only one school was selected, namely SMK Seri Aman, because it met the study criteria. Students at SMK Seri Aman had been exposed to various green practice activities because the school is a sustainable facility. This could also indirectly affect students' understanding of the topic of green technology. Based on the table of Krecijie and Morgan (1970), in using the random sampling method, the researchers took a sample of 152 students, consisting of Form Two and Three students at the school. A simple random selection must involve students whose characteristics match the study population, such as students who had been exposed to green practice activities and students who had studied green technology topics in Form 2.

FINDINGS

Table 1 shows the backgrounds of the respondents. Based on gender, a total of 72 respondents (47.4%) were male and 80 respondents (52.6%) were female. Of the total, an equal number of respondents (76) were 14 and 15 years old (each age group contributed 50.0%). All the 152 respondents were Malays and Muslims. In terms of their Geography subject grade in 2019, a total of 37 respondents (24.3%) got grade A, 45 respondents (29.6%) got grade B and 46 respondents (30.3%) got grade C. In addition, a total of 20 respondents (13.2%) got grade D and four respondents (2.6%) got grade E.

Table 1. Background of respondents

Items		Frequency	Percent (100%)
Gender	Male	72	47.4
	Female	80	52.6
Age	14 years old	76	50.0
	15 years old	76	50.0
Form	Form 2	76	50.0
	Form 3	76	50.0
Races	Malay	152	100.0
Religion	Islam	152	100.0
Geography Subject	A	37	24.3
Grade 2019	B	45	29.6
	C	46	30.3
	D	20	13.2

E	4	2.6
Total	**152**	**100**

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Table 2 shows the level of impact that green practice activities had among students, based on the influence of the green technology concept. The findings show that the highest-level impact item from the green practice activities based on the aspect of the green technology concept was 'Through the use of environmentally friendly food containers, I understand green technology develops products to preserve the environment' (M = 4.03, SP = 1.21). The item at the lowest level was 'Through the production of compost fertilizer, I understand green technology is in line with the concept of sustainable development' (M = 3.86, SP = 1.19). However, this item was still at a high level.

Table 2. Level of impact among students of green practice activities based on the aspect of the green technology concept

Item	SD (%)	D (%)	M (%)	A (%)	SA (%)	Min	SP	Level
Through the use of eco-friendly food containers, I understand green technology develops products to preserve the environment.	13 (8.6)	7 (4.6)	26 (17.1)	22 (14.5)	84 (55.3)	4.03	1.21	High
Through the production of compost fertilizer, I understand green technology is in line with the concept of sustainable development.	9 (5.9)	10 (6.6)	35 (23.0)	37 (24.3)	61 (40.1)	3.86	1.19	High
Through the production of green landscapes, I understand green technology helps improve the level of human health.	8 (5.3)	16 (10.5)	18 (11.8)	48 (31.6)	62 (40.8)	3.92	1.19	High

Through the use of environmentally friendly beverage containers, I understand green technology can reduce the negative impact of human activities.	10 (6.6)	11 (7.2)	28 (18.4)	42 (27.6)	61 (40.1)	3.88	1.21	High

Note: SD=Strongly Disagree, D=Disagree, M=Medium, A=Agree, SA=Strongly agree

Table 3 shows the level of impact green practice activities had among students, in terms of the aspect of green technology product characteristics. The findings of the study show that the effect of green practice activities in terms of the aspect of green technology product characteristics which is at the highest level is the item 'Through the use of natural light during the day, I understand green technology products consist of renewable sources' (M = 4.18, SP = 1.13). Next, the green practice activity item that had the lowest level of effect, based on the aspect of green technology product characteristics, was the item 'Through the use of biodegradable plastic bags, I understand green technology products involve a process of innovation' (M = 3.91, SP = 1.24). However, this item was still at a high level.

Table 3. Level of impact on students of green practice activities based on the aspect of green technology product characteristics

Item	SD (%)	D (%)	M (%)	A (%)	SA (%)	Min	SP	Level
Through the use of biodegradable plastic bags, I understand green technology products involve a process of innovation.	13 (8.6)	7 (4.6)	25 (16.4)	43 (28.3)	64 (42.1)	3.91	1.24	High
Through the use of public transportation to school, I understand green technology products can reduce the rate of greenhouse gas emissions.	9 (5.9)	10 (6.6)	26 (17.1)	31 (20.4)	76 (50.0)	4.02	1.22	High
Through the use of natural light during the day, I understand	6 (3.9)	12 (7.9)	13 (8.6)	38 (25.0)	83 (54.6)	4.18	1.13	High

green technology products use renewable energy sources.								
Through the production of keychains from bottle caps, I understand green technology products can be recycled.	11 (7.2)	7 (4.6)	23 (15.1)	49 (32.2)	62 (40.8)	3.95	1.18	High

Table 4 shows the level of impact among students of green practice activities based on the aspect of the importance of green technology. The findings show that the highest level impact item in terms of green practice activities based on the aspect of the importance of green technology was the item 'Through the production of goodie bags from A4 paper envelopes, I understand green technology can protect natural resources' (M = 4.01, SP = 1.14). Next, the item of green practice activity with the lowest level of effect based on the aspect of the importance of green technology was the item 'Through the production of clothing from waste fabric, I understand green technology can reduce operating costs' (M = 3.88, SP = 1.20). However, this item was still at a high level.

Table 4. Level of impact among students of green practice activities based on the aspect of the importance of green technology

Item	SD (%)	D (%)	M (%)	A (%)	SA (%)	Min	SP	Level
Through 3R practices, I understand green technology can protect ecosystems.	11 (7.2)	7 (4.6)	24 (15.8)	48 (31.6)	62 (40.8)	3.94	1.19	High
Through the production of clothing from waste fabrics, I understand green technology can reduce operating costs.	7 (4.6)	20 (13.2)	18 (11.8)	47 (30.9)	60 (39.5)	3.88	1.20	High
Through the production of goodie bags from A4 paper envelopes, I understand green technology can protect natural resources.	11 (7.2)	2 (1.3)	25 (16.4)	51 (33.6)	63 (41.4)	4.01	1.14	High

Through the production of stationery storage containers from bottles, I understand green technology can reduce waste by recycling materials.	11 (7.2)	8 (5.3)	24 (15.8)	56 (36.8)	53 (34.9)	3.87	1.17	High

Figure 1 shows the overall level of the impact of green practice activities on students. Overall, the highest mean for the level of impact of green practice activities was item 'Through the use of natural light during the day, I understand green technology products use renewable energy sources' (M = 4.18). The lowest mean for the level of the impact of green practice activities was the item 'Through compost fertilizer production, I understand green technology in line with the concept of sustainable development' (M = 3.86). Thus, the impact level of green practice activities as a whole was high (M = 3.95, SP = .78).

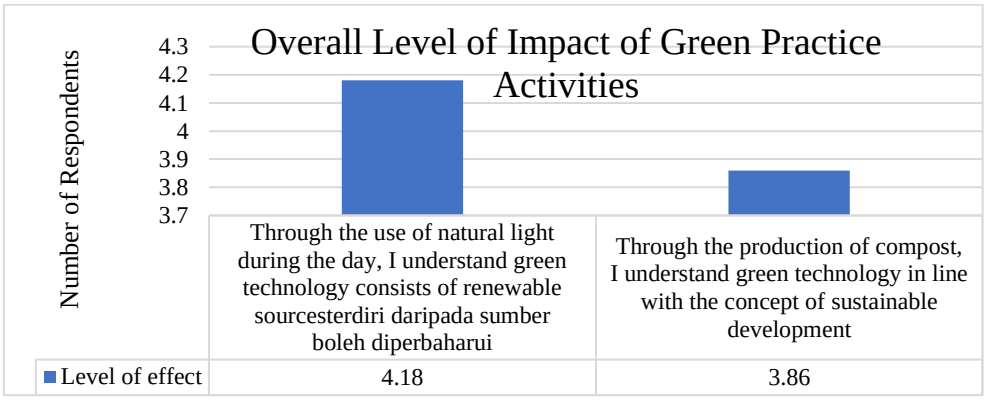

Figure 1. The overall level of the impact of green practice activities on students

Age t-Test and the Effects of the Aspect of Green Practice Activities

This data analysis was implemented to study how age differences (between 14- and 15-year-olds) affected the aspect of the impact of green practice activities on the topic of green technology in the Form 2 Geography curriculum. The hypotheses proposed in this section include:

H0 (1): The impact of green practice activities does not differ based on age.

Ha (1): The impact of green practice activities differs based on age.

Table 5 shows the impact of green practice activities among students in terms of their age differences. The findings showed the mean and standard deviation of 14-year-olds (M = 3.885, SP = .837) and the mean and standard deviation of 15-year-olds (M = 4.022, SP = .713). The mean difference value between the ages of 14 and 15 was 0.137. The t-test analysis showed that the effect of green practice activities did not differ significantly between the ages of 14 and 15 (t = 1.087, p = .279). The results of this t-test showed a significance

level of .279, whereby the value was greater than 0.05 (p> 0.05). This indicates that the impact of green practice activities did not differ in terms of students' ages. Thus, hypothesis Ha (1) was rejected because p> 0.05. The findings show that age does not affect the impact of green practice activities in terms of the understanding of green technology topics in the Form 2 Geography curriculum.

Table 5. The impact among students of green practice activities in terms of age differences

Group	N	Mean (*M*)	Standard Deviation (*SD*)	Df	t-test (*t*)	Significance Level (*p*)
14 Years old	76	3.885	.837			
15 Years old	76	4.022	.713			
Total	152					
				150	-1.087	.279

Gender t-Test and its Impacts in terms of the Aspect of Green Practice Activities

This data analysis was performed to examine how gender differences between males and females affected the impact of green practice activities on the understanding of green technology topics in the Form 2 Geography curriculum. The hypotheses proposed in this section include:

H0 (2): The impact of green practice activities does not differ in terms of gender.

Ha (2): The impact of green practice activities differs in terms of gender.

Table 6 shows the gender differences in relation to the impact among students of the aspects of green practice activities. The findings showed the mean and standard deviation of males (M = 3.740, SP = .808) and the mean and standard deviation of females (M = 4.146, SP = .701). The mean difference value between males and females was 0.406. The t-test analysis showed that there were significant differences between males and females in terms of the effect of green practice activities (t = 3.319, p = .001). The results of this t-test showed a significance level of .001, whereby the value was smaller than 0.05 (p <0.05). This indicates that gender makes a difference in terms of the impact of green practice activities. Thus, hypothesis H0 (2) was rejected because p <0.05. The higher mean value for females (M = 4.146) indicated the greater effect on females that green practice activities had, compared to males (M = 3.740), in terms of the understanding of green technology topics in the Form 2 Geography curriculum.

Table 6. Gender Differences in terms of Aspects of the Impacts on Students of Green Practice Activities

Group	N	Mean (*M*)	Standard Deviation (*SD*)	Df	t-test (*t*)	Significance Level (*p*)
Male	72	3.740	.808			
Female	80	4.146	.701			
Total	152					
				150	-3.319	.001

ANOVA 2019 Geography Subject Grades and their Impact in terms of the Aspect of Green Practice Activities

This data analysis was implemented to examine the differences in Geography grades in 2019 in terms of the impact of green practice activities on the understanding of green technology topics in the Form 2 Geography curriculum. Among the hypotheses proposed in this section are:

H0 (3): The Geography subject grade in 2019 made no difference in terms of the impact of green practice activities.

Ha (3): The Geography subject grade in 2019 made a difference in terms of the impact of green practice activities.

Table 7 shows the differences in the 2019 Geography subject grades in terms of the impact on students of green practice activities. The findings showed the mean effect of green practice activities between the groups based on 2019 Geography subject grades (M = 1.375) and within groups based on 2019 Geography subject grades (M = .584), with (F = 2.352, p = .057). The ANOVA results showed that the significance level was .057, whereby the value was greater than 0.05 (p> 0.05). This indicates that there is no significant difference between the Geography grade groups or within the Geography grade groups in terms of the effect of green practice activities on the understanding of green technology topics in the Geography Form 2 curriculum. So, hypothesis Ha (3) was rejected because p <0.05.

Table 7. Differences in Geography subject grades in 2019, in terms of the impact of green practice activities among students

Causes of Variation	JKD	df	MKD	*F*	*p*
Between Groups	5.499	4	1.375	2.352	.057
In Group	85.914	147	.584		
Total	91.413	151			

DISCUSSION

Level of Impact of Green Practice Activities on the Understanding of Green Technology Topics in the Form 2 Geography Curriculum

The findings of the study on the effect of green practice activities on the understanding of green technology topics are that these effects are at a high level. This is because green practice activities such as these have replaced the traditional chalk-and-talk learning methods. The implementation of green practice activities has helped students to understand the topic of green technology in greater depth, since students have the knowledge and experience to solve problems involving the environment. This is because students' cognitive development results from activities that involve problem solving with the help of others, such as teachers, friends and parents (Suppiah et al., 2015). Teachers interact with students at school because they have the responsibility to help students implement green practice activities. Over time, the responsibility is transferred to students until they can perform green practice activities independently and without adult help. Continuously implemented green practice activities can produce meaningful learning through the use of critical thinking, communication, creativity and imagination in solving environmental problems (Monica Laina & Zamri, 2020; Lezah & Rosy, 2018). If students' thinking is often stimulated, this can help them to understand easily the topic of green technology. This clearly shows the importance of implementing activities that stimulate students' cognitive functions, which can affect their understanding of the topic of green technology.

Differences in Respondents' Backgrounds of terms the Impact of Green Practice Activities on the Understanding of Green Technology Topics in the Form 2 Geography Curriculum

Age

The findings of the study also showed that age did not affect the impact of green practice activities among students. This indicates the importance of existing experience for 14- and 15-year-old students as it is a major factor that can influence student readiness (Suppiah et al., 2015). Existing experience can not only help teachers launch the teaching and learning process but also help students increase their understanding of the topic of green technology through green practice activities. The implementation of such activities has provided students of different ages with opportunities to develop their talents for solving real-world problems. The experience of this can be linked to the teaching and learning process of green technology topics (Mohd Zainudin, 2018). This clearly shows the importance of giving students the opportunity to experience real-world problem-solving because this not only increases their understanding of the topic of green technology but also increases their motivation to be involved in environmental care. Thus, the findings of the study indicate that the effect of green practice activities does not significantly differ between the ages of 14 and 15. Thus, the research hypothesis was rejected and the null hypothesis was accepted: the impact of green practice activities did not differ in terms of age.

Gender

The findings of the study were that gender influences the impact of green practice activities among students. The findings showed that girls were more affected by green practice activities than men. The application of the VAK model (visual, auditory and kinesthetic), which involves the use of various senses, has shown that males and females have different levels of intelligence. This is because the female gender has more skills that are appropriate to the way teachers teach, meaning they are more willing to accept all the input given by teachers (Hanitah & Norzaini, 2018; Mohd Uzir, 2015). The use of all three teaching styles - involving visual, auditory and kinesthetic methods - is acceptable to the female gender, so much so that it affects the understanding of green technology topics. Thus, the findings of the study indicate that there are significant differences between males and females in terms of the effect of green practice activities. Thus, the null hypothesis was rejected and the research hypothesis was accepted: the impact of green practice activities differed in terms of gender.

Geography Subject Grade 2019

Based on the findings of the study, the Geography subject grade in 2019 was found not to affect the impact of green practice activities among students. This is because each student has a different level of acceptance, which can be attributed to the VAK model that combines three teaching styles - visual, auditory and kinesthetic - in the teaching and learning process. The diversity of teaching styles enables students with low levels of intelligence to understand the topic of green technology through the green practice activities implemented. Segamat Municipal Council (2020) stated that the implementation of green practice activities had inculcated elements of creativity and provided opportunities for all students to develop their potential. Usually, students who get low grades are more creative than students who get high grades (Suppiah et al., 2015). This indicates that the level of intelligence does not necessarily affect a student's creativity. Thus, the findings of the study indicate no significant difference between the 2019 Geography subject grade groups and within the 2019 Geography subject grade groups in terms of the effect of green practice activities. Thus, the research hypothesis was rejected and the null hypothesis was accepted: the Geography subject grades in 2019 made no significant difference in terms of the impact of green practice activities.

CONCLUSION

Overall, the effect of green practice activities on improving students' understanding of technology topics can be further enhanced by emphasizing certain aspects that are considered important, especially the implementation of green practice activities because this remains at a moderate level. Therefore, in order to observe a greater impact from green practice activities on the understanding of green technology topics in the Form 2 Geography curriculum, all parties must be actively involved in order to help and encourage the implementation of green practice activities in students' daily lives. Such green practice activities might not only promote environmental care among students but also affect the understanding of green technology topics. This shows the importance of giving students the opportunity to experience environmental care for themselves because this will contribute to their existing knowledge and facilitate their understanding of the topic of green technology.

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