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Technical Note

Climate Change and Environmental Education: Stance from Science Teachers

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Abstract: This study investigated the depth of climate change and environmental education (CCEE) in the current syllabus implemented in Malaysia from the perspectives of teachers, which is an extension to a study entitled 'Impact of Climate Change on Children: A Malaysian Perspective'. This qualitative study involved in-depth interviews with a pool of teachers selected across Malaysia. Due to the enforcement of the Movement Control Order (MCO), the respondents were chosen purposively via advertisements posted on social media that targeted science teachers who taught Forms 4 or 5 CCEE-related subjects. The interview sessions were conducted online from June to July 2021. The recorded interviews were transcribed, coded, and categorized into themes deductively based on the UNESCO-Education for Sustainable Development for 2030 toolbox. The findings yielded five themes, namely, building the capacities of educators, empowering, and mobilizing youth, accelerating local-level actions, and advancing policy. Most of the teachers perceived that the Secondary School Standards-based Curriculum (KSSM) had improved but that the focus should be on a student-centered approach rather than exam orientation. There was a lack of awareness of climate change and environmental action in the science textbook. In conclusion, a comprehensive curriculum, as well as empowerment among teachers and students in a conducive environment for CCEE can spawn proactive action by Malaysian students.

Keywords: climate change; environment; environmental degradation; teachers' perspectives; environmental education

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1. Introduction

The alarming climate crisis has caused plenty of damage to the global community, such as the drought in China [1] and the recent flash floods in Pakistan [2]. Over the years, climate impact has become more prevalent with frequent news on extreme weather events, including the melting of glaciers and heatwaves that affect all mankind. Climate change and environmental education (CCEE) is a key strategic response to mitigate climate change [3–6]. The Global Education Monitoring (GEM) reported the vital role of education in raising awareness pertaining to climate change, adaptation capacity, and the reduction in vulnerabilities to climate calamities [4]. Therefore, holistic engagement is required by the education sector to devise effective intentional actions that strengthen the climate and culture of teachers, students, and communities.

Education on climate change and environmental degradation is a crucial tool to mitigate the current climate crisis [7,8], in addition to promoting strategic climate action [9]. Education is an enabling component for communities and individuals when deciding to mitigate climate change and for providing the capacity to adapt to the imminent adverse climatic impacts.

In response to Sustainable Development Goal 4 (SDG 4), which seeks to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, the Malaysia Education Blueprint 2013–2023 was formulated [10,11]. The aim of this blueprint is to offer a holistic development of all children, intellectually, spiritually, emotionally, and physically by having a strategic and operational shift in the education system [12]. The current syllabi, Primary School Standards-based Curriculum (KSSR) and Secondary School Standards-based Curriculum (KSSM) established in 2017, portray a transformation in terms of content, pedagogy, and assessment components [11].

The KSSM syllabus is a comprehensive reformation of the Malaysian education system to meet the 21st century's needs. Some of the global trends include computational thinking, sustainable development, financial literacy, global sustainability, design thinking, creativity, and education without borders [11]. Since Education for Sustainable Development (ESD) is an integral element in SDG 4, ESD, which concentrates on the current climate crisis and environmental issues [9], has been emphasized in the latest curriculum [13]. However, ESC, which refers to Education for Sustainable Consumption (ESC), did not garner much attention [13]. The ESC denotes the efficient use of resources while preserving the environment, fulfilling the basic needs of the global community, and improving quality of life [14]. Globally, the practical implementation of ESC is fragmented and suffers from a lack of coherence and innovation [13–15].

Despite promoting cognitive skills, the KSSM syllabus is insufficient in promoting behavior change for sustainable lifestyles [16]. Moreover, several specific subjects on CCEE that should be the main priority in the education system are absent. Although environmental education (EE) has been integrated across subjects, commonly, Science, Geography, and Moral Education [13,16,17], many teachers found this topic as insignificant for teaching and learning [18,19], a burden to teach, and had poor knowledge of EE [20]. Biology has more parallel integration with EE content [21].

Since climate change is a critical issue and must be addressed among the students, the integration of CCEE in the syllabus is vital to enhance the comprehension of the school community and take proactive measures to mitigate the issues. In Malaysia, a guideline outlined by the Curriculum Development Division (CDD) in the Ministry of Education (MOE) has mapped the elements to consolidate all the important elements associated with SDG across subjects. The SDG elements in the KSSM syllabus are sustainable production and consumption, global citizenship, and unity. The sustainability production and consumption elements are inclusive of sustainable production, consumption, energy consumption, waste, sustainable transportation and movement, and sustainable building and homes, as well as tourism. As for the SDG global citizenship element, the themes are community systems and living, local issues and relationships with global society, advances in Science and Technology, and ethics. In light of unity, the themes include embracing, respecting, and managing diversity [11,12,22]. The themes in the SDG element offer a broad view of climate and environment-related topics for students, which can increase interest and understanding among the students. However, the absence of evaluation on the efficacy of this guideline to teachers and students forms a loophole in the explicit implementation of CCEE in Malaysia.

Many countries have integrated CCEE into the school curriculum [23] by implementing a structure that is ready to disseminate knowledge and develop skills. Based on a survey, the teachers perceived a moderately high capability of conducting student-based activities and imparting higher-order thinking skills (HOTS) in the teaching and learning process based on KSSM [24]. Teaching CCEE demands knowledgeable and highly skilled educators to enhance students' understanding to become agents of change. In the US, the teachers highly perceived the role of climate change during teaching to prevent skepticism. They emphasized anthropogenic factors and natural causes that contribute to climate change [25]. Turning to Malaysia, EE has been taught regularly in some subjects. Although the teachers were equipped with a guidebook and exposed to EE in the curriculum, challenges arose in the implementation. Some of the reported problems were that some teachers were unaware

of or did not use the guidebook, the lack of detailed instruction provided in the guidebook, and the absence of uniform implementation of EE activities across subjects [18]. The CDD deployed a cascading three-tier training approach to enhance comprehension among teachers about KSSM [11]. This cascading strategy was time-consuming and selective for certain teachers only [24]. Moreover, this method affected teachers' interest, understanding, and interpretation, especially for CCEE. Although EE has been integrated for almost a decade across subjects in the syllabus, the content is inadequate and not inclined to the current trend, which is climate change. For CCEE to be part of the syllabus and stand alone as a subject may demand comprehensive planning and implementation.

Despite all the efforts made by the MOE and the teachers toward educating and implementing climate change and environmental topics or global sustainability topics in the subject, several questions are posed: 'how much do the students understand and value this topic, as well as act proactively toward a sustainable lifestyle or take any environmental protective action?' and 'how depth is the teachers' understanding and effort when it comes to CCEE?' Form 5 students aged 17 years are the determining point if climate change and environmental topics or global sustainability topics in the KSSM syllabus have successfully instilled a sense of responsibility and value toward the environment. Thus, this study explored the understanding of CCEE among Malaysian Form 5 students based on the perception of science teachers. The second aim of this study is to determine the additional requirement sought by teachers to teach climate change and environmental topics. This is a preliminary study to develop an interactive teaching tool for CCEE applicable to all teachers.

This manuscript is composed of a few sections. Section 1 presents a brief background of CCEE in Malaysia. Section 2 explains the methodology of this study. Section 3 describes the study outcomes. Next, Section 4 discusses the findings and the limitations. This study is concluded in Section 5.

2. Methods

2.1. Study Design and Duration

This cross-sectional qualitative study commenced from May to October 2021.

2.2. Content Analysis

A thorough content analysis was conducted by MIAW and AMAK on all the subjects in the current KSSM textbooks. Based on the content analysis, subjects' Core Science, Biology, Chemistry, and Physics of Form 5 have topics that emphasize climate change and environment-related content (Supplementary File Table S1). All subjects were screened based on indicators in Supplementary File Table S1.

The findings showed that subjects Core Science (Chapter 3: Sustainability of the Environment) and Chemistry (Chapter 5: Consumer and Industrial Chemistry) support CCEE. In Biology, a theme is designated for ecosystem and environmental sustainability. This theme is composed of the following three chapters: chapter 8 on biodiversity, chapter 9 on ecosystems, and chapter 10 on environmental sustainability.

2.3. Study Tool

The outcomes derived from the content analysis facilitated in structuring the components of the semi-structured questions. Details of the questionnaire are listed in Supplementary File Table S2. Data saturation was discussed with other researchers.

2.4. Data Collection

An advertisement was posted on social media (Facebook, Instagram, and Twitter) for a month (June–July 2021) to recruit Science teachers in Malaysia (Figure 1). The advertisement stated 'Respondent needed from all secondary government schools across Malaysia. The inclusive criteria for selecting the respondents are those who taught Science or Science-related subjects for Form 5 and had at least 2 years of teaching experience in Science or Science-related subjects. Those interested were requested to contact the research team in

order to schedule an online interview'. Purposive random sampling was employed based on the selection criteria. This study took place during the Movement Control Order (MCO). To ensure health safety, the recruitment and interview were carried out online to practice social distancing. The inclusion criteria are Malaysian government school teachers with experience in teaching Science or Science-related subject in secondary schools in Malaysia for a minimum of 2 years. Teachers who taught in non-government schools and were unable to be interviewed online were excluded from this study. Thirty respondents signed up for this study at the initial stage. After screening the respondents, only 17 respondents met the criteria. All the respondents were scheduled for an online interview. The interview sessions were scheduled for July–August 2021 via Google Meet. Each session lasted for 1–2 h and was conducted by an interviewee and a notetaker. By the 11th respondent, the saturation point was achieved.

Figure 1. Online advertisement posted by the research team on social media such as Facebook, WhatsApp, and Instagram.

2.5. Data Analysis

All recorded audio and video of the interview sessions were transcribed verbatim. Analysis was performed manually to maintain a significant interpretation of the data [26]. An initial code was generated from the transcripts to describe patterns/themes [27]. The themes were deductively segregated based on the five priority action areas (see Table 1) outlined in the UNESCO—Education for Sustainable Development for 2030 [28]. Deductive

analysis was carried out to determine if the findings were parallel to the ESD needs. This thematic analysis was conducted by NK. The generated themes were reviewed and refined by ZIIZ and HO. A checklist of items (consolidated criteria for reporting qualitative research-COREQ) was used to report the findings (Supplementary File Table S3).

Table 1. The themes generated are based on Education for Sustainable Development (ESD for 2030).

Themes	Sub-Themes
Building capacities of educators	• Sustaining teaching quality • Diversity in teaching approaches
Advancing policy	• Improvement in curriculum • Implementing conceptual learning, self-regulation, and student-centered approaches • Early exposure
Transforming learning environment	• Experienced-based learning, beyond the classroom • Guideline in teaching and guided activity
Empowering and mobilizing youth	• Lack of student efficacy to act
Accelerating local-level actions	• Lack of awareness and action by the community • Temporary implementation of the (Recycle, Reduce, and Reuse) 3R campaign

3. Results

3.1. Demographic Finding

Only 11 respondents were interviewed online upon attaining saturation in the findings (see Table 2). A previous study depicted that novice teachers are categorized into 0–3 years of experience, teachers with 4–5 years of experience are categorized in the transition group, and teachers with more than 5 years of service period are categorized as experienced teachers [29]. In this present study, two respondents are categorized as novice teachers, while the rest are experienced teachers.

Table 2. Demographic information of the respondents.

Age Range (y/o)	Current Subject Taught	Form	Service Period (Years)
20s–30s	Biology	4 and 5	2
50s–60s	Biology Core Science	4 4	25
40s–50s	Biology Chemistry	- -	8
20s–30s	Biology Core Science	4 and 5 4 and 5	6
40s–50s	Biology English	4 1	13
50s–60s	Biology Core Science	4 and 5 1, 2, and 3	24
50s–60s	Biology	5	30
30s–40s	Core Science	4 and 5	7
40s–50s	Biology	4	10
20s–30s	Biology	4 and 5	2
30s–40s	Biology Core Science	4 4 and 5	6

The findings were categorized into the five priority areas of ESD since MOE has integrated the sustainable development-related topics into the KSSM curriculum.

3.2. Theme 1: Capacity Building of the Educators

The first theme refers to the capacity building of the educators, which led to the identification of the teachers' capability in teaching and integrating climate change and environmental issues in the subject. Based on the interviews, the novice teachers required a mentoring program to enhance their capability to teach and to gain more experience in teaching. As stated in Interview 7, the respondent was responsible for establishing a Professional Learning Committee to guide new teachers. The mentoring project is a mechanism to support new teachers to teach various subjects effectively.

> "*... First, (we) always give motivation to new teachers. The second is PLC (Professional Learning Committee). Third, we always help teachers improve their way of teaching... "* (Interview 7, Female)

Some of the novice teachers lacked interest in teaching an environment-related topic and did not emphasize the current climate crisis to the students. Meanwhile, experienced teachers felt obligated to educate the students to increase their awareness.

> "*... this topic is what I don't like the most. Maybe it's my preference, l love all about viruses and bacteria, but all kinds of social science like this is not really my forte actually.*" (Interview 1, Female)

> "*... I felt responsible to share my knowledge to them (students).*" (Interview 2, Male)

Textbooks remained the most important medium to gain knowledge for both teachers and students. Another approach adopted by the teachers was via 'star of success' that increased the motivation among students by crediting stars for their excellence in continuous assessment.

> "*... I always refer to the internet and reference books. But a textbook is always the main reference for students' activities since students were provided with the textbooks... "* (Interview 4, Female)

> "*... different students displayed different achievements and were evaluated based on the 'Star of Succes' system. Those who answer correctly will get a star and the collected stars are eligible for free vouchers.*" (Interview 7, Female)

The capabilities exhibited by the teachers were reflected in their approach toward teaching. Varying perspectives were observed in experienced and novice teachers. Experienced teachers were capable of diversifying their teaching methods, making the learning process fun. Notably, the experienced teachers emphasized the importance of the 'experience' element for EE and conceptual learning. The passion displayed by the experienced teachers is portrayed in the following statements,

> "*Education has two methods, one of them is experiencing. Here, the environment has a role to play.*" (Interview 2, Male)

> "*... one of the keys approached in teaching is conceptual learning. For environment-related topics, a student who lives in urban area like Selangor is exposed to pollution more than students in rural area. Students in rural areas may not understand the need to understand the topic.*" (Interview 4, Female)

> "*... there are plenty of experiments that can be carried out at home with some innovation so that students can learn even during COVID-19 (Coronavirus Disease 2019).*" (Interview 3, Female)

Most of the respondents made a substantial effort to deliver climate change and environment-related topics to the students. Some of the approaches are story-telling, video, group projects (e.g., watching movies), and hands-on activities.

> "*... this topic is easy to understand because it can be delivered by story-telling. The students can understand if we use the story-telling approach.*" (Interview 3, Female)

> "*... for this topic, we (teachers) usually ask students to find information and present the findings using Powerpoint. This is the common teaching method for this topic... most of the teaching aids that I use during classes are from abroad.*" (Interview 6, Female)

"*I recently gave homework to the students, to watch a movie called 'Twister'. It is about a hurricane... students will then summarize the movies and relate to the topic... "* (Interview 3, Female)

"*There is hands-on activity in the syllabus... Only sometimes we have limited time to carry out a complicated activity. Let's say we want to perform a plastic upcycle activity... it can be done during extra-curriculum session.*" (Interview 1, Female)

Other respondents chose to relate the CCEE with the current situation by involving social media platforms, such as Tik Tok and Facebook, by portraying a role model to set an example to the students. This strategy was used to capture the students' interest in climate change and environment-related topics.

"*... Students are very easily influenced by social media which is full of entertainment. Teachers had to get involved in the world of entertainment, for example, TikTok... "* (Interview 5, Female)

"*... I have a friend who works at Malaysia Science Academy, so I invited her to my class. She's currently researching the utilization of anergic in Kedah... so, a lot of students asked how to become an engineer like her. I have 20 students who personally messaged me asking about policies related to this topic ... "* (Interview 1, Female)

Numerous ways were deployed by the teachers to cope with the current trends in education. A current dispute arose on whether to teach based on the need of the exams or to go beyond the textbooks that input the global crisis. A short period allocated for this topic was deemed to be the biggest hurdle faced by the teachers. Most respondents implemented textbook-based and exam-oriented teaching. As it was difficult to execute all the tasks listed in the textbook, the teachers merely focused on exam-related topics only.

"*... this chapter is placed at the end of the textbooks and August is a crucial month to prepare the students for the Malaysia Certificate of Education ('Sijil Pelajaran Malaysia'-SPM). Teachers are occupied with extensive exercises to prepare the students for SPM. Teachers will only teach this topic and skip the time-consuming activities stated in the textbooks.*" (Interview 6, Female)

"*... usually, I will skip these experiments. We only focus on the important experiments. For this topic, the important experiment is the Biochemical Oxygen Demand (BOD). Other experiments are not enlisted as important for SPM.*" (Interview 7, Female)

"*Every teacher is different. I think other teachers prefer the exam-based approach and the only activity that they do is the BOD experiments.*" (Interview 2, Male)

3.3. Theme 2: Advancing Policy in the School Curriculum

Referring to this second theme, advancing policy refers to the teachers' opinion on the current curriculum outlined for the subjects of Biology and core Science. In 2021, changes were made to KSSM by segregating the topics; Form 4 covers only human and animal biology, while Form 5 covers plant biology and environment. Most of the respondents described the new syllabus as more comprehensive, informative, and effective than the previous Secondary School Integrated Curriculum (KBSM).

"*... KSSM has improved a lot when compared to SSIC... it's good... "*

(Interview 6, Female)

However, 45% (n = 5) of the respondents claimed that the topic is too detailed and was perceived as a burden for the students.

"*... I think this topic is too heavy with ideas.*" (Interview 2, Female)

"*As teachers, we can digest a lot of information. But for students, it might be a burden.*" (Interview 3, Female)

In this study, conceptual learning can enhance the skills of students by focusing on self-regulated learning in the classroom. A comparison was made with the education system implemented in other countries to accentuate the importance of self-regulated learning.

> "*The advantage of the Western education system is that they train the students to a level where they can be independent, which is what we call a self-regulated learner... They indirectly train their skills. Skills need to be implemented practically and not be given through lecture.*" (Interview 1, Male)

All the respondents perceived early exposure to conceptual learning on climate change and environment-related topics as a catalyst to nurture a sense of responsibility among the students.

> "*... look at the Western people, they are diligent about early education such as pre-school. Even 1 to 3 year-old toddlers are introduced to the nature ...* " (Interview 1, Male)

Apart from early exposure to climate change and environment-related topics, the student-centered approach was viewed as a vital strategy to enhance students' knowledge and attitude toward sustainable development. Student-centered learning and teaching open more opportunities for students to explore climate change and environment-related areas.

> "*... the way we teach now is more to student-centered learning...* " (Interview 7, Female)

One of the important points issued by the respondents is poor coherence from primary up until tertiary education in Malaysia in promoting the adaptation and mitigation of climate change and the environment.

> "*... we are fragmented. Tertiary education focuses on its work, secondary education focuses on its work, and primary education focuses on its work. Free education focuses on its work. We are all affected. If the primary school syllabus is not right, then we need to prepare the umbrella before it rains, because the outcome will be worse at the tertiary level.*" (Interview 6, Female)

There is also an urgent need to revise the syllabus based on a detailed evaluation. This is to identify and solve any emerging disparity found in the syllabus.

> "*... Malaysia (education system) is so smart in covering up problems. I give an example, among the maths problems in primary school is problem-solving. When the question cannot be answered by a Standard 6 student, the same question will be introduced to Standard 1... If Standard 6 can't answer, why give it to Standard 1? Later, the student will end up being a dropout... In Malaysia, they just 'patch' the problem. That's how it is in Malaysia.*" (Interview 1, Male)

3.4. Theme 3: Transforming the Learning Environment

The third theme refers to transforming the learning atmosphere. The previous learning and teaching in the Malaysian education curriculum focused on textbooks and examinations. To date, project-based learning (PBL) and extracurricular activities are embedded to increase students' awareness. Students participate in extracurricular activities, such as competitions, to promote their applied skills and to gain more exposure to this topic.

> "*... yes, PBL is very important for students to think how to do, ... students will be given a task and they will work in a group to run the PBL. The PBL method can be applied in all subjects, including the Malay language subject.*" (Interview 6, Female)

> "*... I used to bring the students to the Tabin Wildlife Reserve. Only then they would know how certain trees look like. This is because, some students have never entered a forest... they must experience it.*" (Interview 1, Male)

> "*... I always organize field studies, such as visiting mangrove swamps in Kuala Selangor... it was so exciting when we went to many places. We could perform many activities at the mangrove swamp and observe the effects of environmental pollution on the mangrove swamp, such as the perishable animal habitats due to failure in preserving the mangrove*

swamp... Only then do the students learn to appreciate the nature and we can nurture their love for the environment... " (Interview 6, Female)

Since CCEE is a broad topic, providing a guideline for teaching and guided activities should reduce the teachers' burden. Some teachers highlighted the importance of having a guideline for activities. A guideline or a handbook of activities related to the learning outcomes can assist the teaching process and reduce preparation time.

"*... it will be good to have a detailed guideline on the activities. We don't have ample time to do research and prepare for the material... "* (Interview 1, Female)

The learning ambiance in schools needs to be reformed. This can be executed by appreciating the value of knowledge and by focusing on skills development, especially the communication ability among the students.

"*The only thing we lack is skills education. Science students are better known bookworms. At school (primary and secondary)... the students are passive. The system doesn't give an advantage if one is good at talking, right? Examination is the only evaluation. But, at university, the evaluation covers many aspects including communication skills, leadership, and teamwork through presentation, group work, examination, and continuous assessment.*" (Interview 1, Male)

"*... educate to become a behavior. That's what we lack... We spent a lot of energy, several years, 11 years in education... value is the most expensive... Values are not enough to be taught verbally, they have to be practised. The one who always does until it becomes a behavior, then it can be appreciated... Because we don't have a lot of content, we implement lifelong learning... So this is our problem, no matter how much content you provide, with a huge amount of knowledge, if there is no sense and value, it will be pointless.*" (Interview 1, Male)

3.5. Theme 4: Empowering and Mobilizing Youth

Theme four, empowering and mobilizing youth, aims to determine the teachers' perception of students' capabilities in understanding climate change and environment-related topics. Student empowerment is crucial to raise their awareness about the mitigation of climate change and environmental degradation. Most of the respondents agreed that the current syllabus is incapable to spark motivation among the students to act proactively.

"*... we made compost to use as fertilizer at school. Sadly, it's not a continuous activity because the newer batch of students don't continue this activity... it's hard to cultivate this attitude among students.*" (Interview 6, Female)

"*... my personal opinion is that if our goal is to make them (the students) aware of the climate change and environmental issues, it will not be achieved (through textbooks).*" (Interview 4, Female)

Referring to Interview 6, no effort was shown by the students to continue the initiative taken by the teacher. These upsetting findings remarked the incompetence and lack of self-efficacy among the students to mobilize climate action. Another hurdle in CCEE is the students' attitude and lack of interest to read. This is an alarming situation for the teachers. Teachers must work harder to explain to the students creatively. Lack of tolerance by the students to read prior to the class is burdensome for teachers, especially novice teachers.

"*... We want to make it easier for students by giving them textbooks. No reading then no way they can understand the topic... . Maybe for the top-class students, only 1/3 of them will be able to learn on their own... hands-on activities will help students to understand, because to execute the task, students need to read the textbook first.*" (Interview 5, Female)

"*... mastering this topic all depends on the student's effort. If students read diligently, they will master (this topic).*" (Interview 4, Female)

When socioeconomic factors restrict accessibility to information, the textbook is the sole source of information for some students, especially for those residing in remote and rural areas. Access to information is crucial, especially in this 21st century, where unlimited exchange of information happens across and through all kinds of borders and boundaries. For teachers, poor access to information disrupts the teaching and learning sessions. Teachers must find other strategies to ensure all students acquire the trending issues.

> "*There are students who depend on biology books only... and some can get information from various other sources...* " (Interview 7, Female)

Youth empowerment and mobilization demand a proactive and urgent strategy to be executed. Another setback that contributes to the lack of empowerment and mobilization is the memorizing culture. This culture was imparted a long time ago to score high grades in examinations.

> "*... so for those who didn't know, the teaching approach is memorization.*" (Interview 2, Female)

> "*... I'm not sure if they don't understand, but for this topic, they need to memorize, no need to understand but must memorize.*" (Interview 4, Female)

> "*We teach a lot, we mention the values a lot, we even memorize the values. But we lack practical approach. Compared to Japan, why are Japanese so clean?, they are taught to clean at school. They have no cleaning staff. The students clean the toilet.*" (Interview 1, Male)

3.6. Theme 5: Accelerating Local Level Actions

In this study, theme five, accelerating local level action, denotes promoting and enhancing action by the community. The Reduce, Reuse, and Recycle (3R) campaign is an example of implementing the CCEE. Based on the interviews, lack of enforcement, lack of recycling collection areas, and low acceptance by the community hindered the community from taking action to mitigate, as well as to adapt to climate changes and environmental degradation. The limited information about recycling management and the absence of waste chain management for the public makes matters worse. Some schools promote the 3R campaign, where all students are required to participate. Nevertheless, nurturing students' attitudes must start at home.

> "*... a teacher did this 3R program on his own... the students come to school with recycling materials... . it is quite difficult to nurture the attitude if their parents have never been educated about this matter...* " (Interview 10, Female)

> "*... I want to emphasize the 3R program. We teach this program in schools, but this program is not implemented comprehensively throughout the country... Make sure every village has the information. Need to have a promotion to encourage this thing.*" (Interview 5, Female)

4. Discussion

The topic of climate change and environmental education (CCEE) has been long incorporated into Malaysia's education syllabus. Four teachers (34%) with almost 30 years of teaching experience were interviewed in this study. Among them, three were 50–60 years old and one was 40–50 years old. Around 63% (n = 7) of the respondents were novice teachers with experience of less than 10 years. Three novice teachers were in the categories of either 20–30 and 30–40 years old, while one teacher was 40–50 years old.

A number of past studies have looked into teachers' perceptions, but mostly they only focused on environmental education. With the current syllabus of the KSSM curriculum, it is imminent to determine the teachers' perspective on students' capabilities to value the CCEE embedded in the KSSM curriculum. Evidently, most of the teachers had a good understanding of climate change and were aware of the climate crisis and environmental degradation happening both locally and globally. The students were perceived to have

good knowledge about climate change and environmental degradation since the issues can be found in the local news. However, the teachers noted that values and skills related to CCEE were lacking among the students.

Various methods were implemented by the teachers to teach the students topics revolving around climate change and the environment. Most of the experienced teachers adopted a student-centered approach and implemented a host of strategies to integrate climate change and environment-related topics into the subject. The diversified methods implemented by teachers to teach climate change and environment-related topics have been proven effective in previous studies, including experiential, inquiry-based, and student-centered teaching approaches [30–32]. Experienced teachers deployed metacognitive strategies in teaching by focusing on developing the students' thinking skills and providing opportunities for knowledge transfer [33]. Experienced teachers displayed more prominent teaching skills when compared to novice teachers supported by the teachers' level of education and the subject area [29,34]. While there is no evidence of low teaching quality for novice teachers, deterioration of teaching quality was detected among teachers with 4–5 years of experience [29]. Some teaching approaches implemented by the respondents, despite their vast teaching experiences, were watching and discussing climate impact-related movies, organizing a field trip close to nature (i.e., mangrove swamp), utilizing social media platforms (e.g., Tik Tok and Facebook), performing hands-on activities, and having debates and small group discussions, as well as inviting an expert to the class as a role model for the students.

One vital aspect to engage with the students is to provide diversity in teaching climate change and environment-related topics. Role-plays and simulations provide a better understanding of climate projection [35]. A presentation that uses music and graphics can increase students' knowledge and engagement on climate issues [36], while visual imagination (e.g., documentary series) significantly increases students' interest and response [37]. Via inquiry-based activities, students can better understand the concept and the complexity of system interactions in light of climate change [35,38].

Some inexperienced teachers only used the textbook contents, including all the group exercises outlined in the textbook. These teachers displayed a lack of interest to interpret the topic beyond the textbook due to different backgrounds. Hence, it is fundamental to provide a targeted and effective professional learning and support culture for all teachers to boost their quality of teaching. Much effort has been made to conduct seminars, courses, and training for teachers to boost their interest and awareness pertaining to the climate crisis and environmental issues [20]. This approach concentrates on implementing EE in both formal and informal education systems [11,19,34]. For instance, the Professional Learning Committee in one of the schools provided continuous professional development [39,40] to enhance the teachers' characteristics, pedagogy application, and change in attitude and instructional practice [40,41], as well as skills and teaching styles [42]. The collegial relationship facilitates co-teaching, along with the ability to influence teaching training and mentoring [43].

The CCD (MOE) delivers the latest curriculum on climate change and environment-related topics via a three-tier cascading method. It starts from central (CDD) to master trainers (officers recommended by the respective state departments), master trainers to state trainers, and state trainers to selected teachers in each school. The selected teachers were required to conduct in-house training for the other teachers [24]. The successful implementation of CCEE in schools is largely connected with the commitment, effort, and level of enthusiasm of their principals and teachers [18]. The depth of CCEE depends on the teachers' commitment [19,34]. Apart from that, subject specialization could restrict the creativity and flexibility aspects of a teacher [17,19,24] to teach CCEE topics. Guidebooks on CCEE and classroom/outdoor activities may stimulate the teachers' capabilities to teach CCEE effectively.

Exam-oriented teaching methods are mainly implied by all the teachers, as CCEE is not holistically implemented as a subject on its own [19,24]. Hence, the teaching of

CCEE among Science teachers in Malaysia is sufficient to impart knowledge, but unable to cultivate action-emphasized CCEE [19,44]. Climate change is best taught with personally relevant and meaningful approaches that deploy engaging teaching strategies, encourage deliberative discussion to explore and navigate disagreements and controversial issues, engage students in the scientific process, address misconceptions, and incorporate school or community projects in which students can act [32]. Notably, CCEE is best adapted and harmonized to the current environmental, political, economic, and cultural realities [45].

The core of science education is intellectual and practical abilities that work beyond disciplines to develop responses to global challenges, such as the alarming climate crisis [46,47]. Activities outlined in KBSM and KSSM are unable to induce climate action among the students, mainly because there is no requirement for the students to learn climate change-related topics to graduate [48]. Education is an important tool to shape a comprehensive understanding of the current climate crisis and environmental status among students. Curriculum reformation has received positive feedback from the teachers [24], who regarded KSSM as comprehensive yet heavy with ideas. Nonetheless, one of the respondents claimed that the efficacy of KSSM in promoting behavioral change toward a sustainable lifestyle has yet to be studied [19]. Although a gradual infusion of climate change and environment-related topics across subjects has been initiated since the 1970s [17], inconsistencies have been observed in the implementation. As depicted in [19], no clear vision of environmental education is stipulated in Malaysia's education system, the curriculum only provides surface knowledge of the environment with weak association with the current environmental issues during teaching and learning [21], and does not apply self-regulated learning. The weak emphasis on global sustainability is noted in KSSM content and learning standard, except for Geography, Moral Education, and Science subjects [24].

Another important finding from these themes is the significance of early education on climate change and environment-related topics. According to [49], educating middle-school children on climate change can be one of the most important ways to save the planet. They may also influence parental perspectives on climate change. As reported in [50], 94% of early childhood EE took place in a formal setting, whereas 83% of the teaching and learning sessions were carried out outdoors and close to nature. A few key indicators were used to determine the efficacy of early exposure to climate change and environment-related topics. These indicators, which were derived from 66 reviewed studies, include environmental literacy development, cognitive development, and social and emotional development, as well as language and literacy development [50]. Most teachers agreed that early exposure to climate change and environment-related topics is crucial for early awareness. Parents should inspire their children to protect the environment. Some exemplary actions that can be practiced in everyday life include reading a relevant storybook, using visuals to teach children, practicing energy-saving techniques (turning off lights when not in use), and participating in a community activity (recycling) [51]. Volunteering activities regarding the environment are capable of inducing positive environmental behavior [45].

It is important to make climate change education personally relevant to the students. The National Association of Biology Teachers identified the environmental concept as relevant to students' everyday lives [52]. Climate change scholars suggested that students should not view climate change as a speculative or nebulous threat, but as something that can be seen in their communities [32]. Science education should focus on global climate change due to the need for societal action in mitigating its effects [53,54]. Much emphasis must also be placed on experiential learner engagement through laboratories, group work, study trips, and classroom discussions [32].

The student-centric approach for CCEE can equip the younger generation to comply with future socio-environmental, economic, and political uncertainties due to the prevalent changing climate [55]. Peer-supported learning is beneficial for teaching CCEE, as it facilitates students to feel more relaxed and pleasant during the learning session [55]. Transformation in learning is in dire need. Experienced-based learning beyond the classroom is

the preferred method by the respondents when it comes to teaching environment-related topics. Students' active participation using creative, artistic practices can overcome psychological barriers and make climate change a means for them [56]. The connection among peers who share a similar approach to the study is useful in CCEE [55]. This learning strategy strengthens the community and builds relationships within the learning process, which is an additional benefit to climate resilience [57].

Youth represent a powerful force for social change and play a vital role in climate response [58]. The study respondents mostly reported that the students lacked interest in reading textbooks and lacked motivation. Reading is a subjective norm in the teaching and learning process. Due to some restrictions, such as poor accessibility to the Internet and the absence of a laptop, the textbook is the primary study tool for some students. Bright students can easily understand CCEE topics by learning on their own, whereas average students require the role of a teacher to creatively explain climate change and environment-related topics. Topics on climate change and the environment can be taught via group discussion and hands-on activity to increase the chances for students to understand and acquire decision-making skills. This study unveiled students' low self-efficacy to engage in climate-emphasized activities. Engagement with the students is crucial, especially in project-based and practical learning (e.g., local school farms), where students can learn about climate change and the environment in multiple ways [59]. Moreover, the exam-based teaching approach restricted the students from acting proactively against climate change and environmental degradation. Skill development seemed to be inadequately emphasized during the teaching of CCEE.

The students, who are purported to act as agents of change, displayed poor credibility and capabilities to persuade their family members and the community in tackling climate change and environmental degradation. There is a need to restructure the system, especially the waste chain system. Policymakers need to consider waste management as a source of income. Applying the concept of 'waste to wealth' is a viable strategy for transforming solid waste into a commodity in order to limit the use of new materials, besides decreasing the amount of waste [60,61]. The implementation of climate change mitigation and adaptation activity should be explicit for all ages as they involve the participation and empowerment of the community. The 3R campaign should be organized extensively with the engagement of all levels, from children to the elderly. Schools have been promoting 3R as an extracurricular activity, which seeks support from both parents and the community at the local level. Actions taken by teachers in initiating the 3R campaign in schools might influence students' learning activities [62]. The messages penetrate only schools located in cities, and do not cut across all schools, especially schools in rural areas. Parents and the community must come hand in hand and practically implement 3R in their daily life. Hence, the local authority should ensure that information on 3R is disseminated thoroughly. Proper waste chain management is a huge step toward supporting climate action.

The vital challenge in implementing CCEE is exam-oriented teaching and learning. The current compulsory examinations are for Standard 6 (Ujian Penilaian Sekolah Rendah-UPSR) and Form 5 (SPM), which have diverted the aim of education from owning knowledge, embracing values, and acquiring skills to meet 21st-century needs [18,19]. This exam-oriented approach is a hindrance among teachers, as they need to achieve their key performance index (KPI) by ensuring that the percentage of passing students increases each year. Topics pertaining to climate change, the environment, and sustainability are excluded in the examination [19]. Hence, time constraints to feed the KPI may cause this topic to garner less attention. Teachers' capability and effort tend to differentiate the implementation of CCEE in classrooms; going by textbooks or participating in outdoor activities. Outdoor activities have implications to develop self-awareness [63]. Despite the various methods deployed to teach CCEE (e.g., using documentary videos), they do not portray the local scenario. Hence, students fail to relate their life to the climate-changing situation within the local context. This neither made them understand nor made them feel responsible toward nature. The curricula across primary to tertiary education levels are fragmented. Poor

coherence in integrating CCEE from primary to tertiary education makes it impossible to generate students with effective decision-making skills and the ability to engage in society to create climate awareness. The lack of a transdisciplinary coalition among government bodies acts against the sustainability approach. When it comes to CCEE, the quadruplex helix model approach is viable when government agencies, local communities, industry, and academic institutions are involved.

Both KSSM and KSSR are in the 5th year of implementation. Thus, the absence of a critical evaluation by the CDD (MOE) restrains the improvement in the implementation, especially the CCEE, thus limiting the needs of the curriculum from the stance of teachers and students while assimilating the achievement of other countries [19,24]. The MOE can consider the Mezirow's transformation in the learning process, which includes experience, critical reflection, reflective discourse, and action [63,64]. With the cascading approach in guiding the teachers on CCEE via the current curriculum, it is time consuming and burdensome for teachers. Evidently, promoting the transformation in the learning environment would definitely increase students' awareness and encourage climate action [19] toward adaptation and mitigation. One culture that emerges from the exam-oriented approach is memorizing ability. For some subjects (e.g., Biology), another way to score highly in the exam is via memorizing, and this culture has been in practice for a very long time. Instead of embracing the knowledge and values of CCEE, one can merely memorize to pass the exam. Since CCEE is not a vital topic for examinations, the lack of hands-on and outdoor activities affects the self-efficacy among the students. Moreover, climate change, the environment, and sustainability-related topics take years before forming a core subject on their own.

Several limitations were noted in this study. This study was conducted during the COVID-19 pandemic when restrictions on physical contact were widely enforced. This reduced the chance of attracting more respondents to participate in this study. Hence, the selected respondents must have had access to the Internet and laptops. Only one month was allocated for data collection due to the short project duration. Data collection was performed via social media. If we were able to contact the CDD of the MOE, there would have been a higher chance of finding more respondents across the country.

The COVID-19 pandemic that had affected all sectors globally, including the education segment due to sudden school closures [65], has shed new light on education [62] with almost 94% of the world's student population affected [66]. The abrupt transition to virtual teaching and learning posed a huge challenge for learners and educators. Remote e-learning was associated with several issues, such as accessibility, affordability, flexibility, learning pedagogy, lifelong learning, and education policy [66,67]. In Malaysia, some schools in remote areas lacked access to information and communication technology (ICT) tools and Internet networks. Almost 1.8 million (40%) Malaysian students had no access to the Internet for e-learning during the pandemic [68,69]. The ugly truth about e-learning in Malaysia is that it would take more time for comprehensive implementation, especially in rural regions [70].

The transition in the education system from school-oriented to virtual platforms demands substantial support from parents, teachers, guardians, and school administrators in order to ensure optimum focus and progressive learning by the students [71]. The suitability and relevancy of the pedagogy for online education rely heavily on the capabilities and the understanding of ICT for both teachers and learners [66,72]. Teachers have a strenuous process to adapt and cope with new teaching methods that come with insufficient facilities and equipment. Some might even face personal issues, such as the inability to conduct online teaching and fear of using the technology [73]. Turning to this present study, only 17 respondents were selected for the interview as the other teachers faced technical issues, such as hectic schedules of online classes and unstable Internet connection that restricted smooth participation in this study. After each interview session, the researchers discussed the interview to identify the outcomes. As a result, the data saturation point was achieved after interviewing the 11th respondent.

5. Conclusions

Evidently, CCEE is vital to inculcate in individuals and communities a sense of belonging to nature, while indirectly creating awareness on mitigating and adapting to the deterioration of the environment due to climate changes. The study outcomes showcased a positive response to the KSSM syllabus. However, it is inadequate to impart the necessary values, skills, and behavior to adapt and mitigate climate change, as well as environmental degradation. This is indeed worrisome as the climate crisis is on the rise at an alarming level. Teachers have to bear the brunt of the flaws of the education system. However, teachers are always innovative in the teaching of CCEE. The MOE needs to appraise its curriculum or implement a tailored module promptly and always be receptive to critics. The CDD of MOE must ensure that CCEE is given priority in the future and that technology is applied progressively for this study area. Launching a website that is accessible to students and teachers dedicated to online learning will ease the burden of teachers. There is an urgency to make climate education a necessity at all levels. Policymakers need to walk the talk by implementing a practical approach, such as 3R practice in daily life at all levels. The authorities involved should provide sufficient facilities that support 3R at the community level. Industry and academic experts need to collaborate to generate applicable innovation. Moving forward, climate policy needs to be more scientific.

In conclusion, a comprehensive curriculum that empowers teachers and students in an environment that is conducive, along with effective community engagement and CCEE, can spawn proactive climate action by Malaysians. More studies are called to assess the efficacy of pedagogy and CCEE in terms of their implementation and time, as well as the skills development of students in both primary and kindergarten levels.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su142416618/s1, Table S1: Content analysis of the topic in the textbook of Sciences, Biology, Chemistry, and Physics from Form 5 level; Table S2: In-depth (IDI) interview questions; Table S3: Consolidated criteria for reporting qualitative studies (COREQ) 32-item checklist.

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