Abstract: Since the United Nations’ declaration on education for sustainable development (ESD), countries and universities across the globe aim to enhance sustainability consciousness, knowingness, attitude, and behavior among learners. However, there is no consensus on pragmatic approaches to achieving environmental sustainability. The ESD action-oriented approach unmasks the complexities of sustainable development and develops learners’ action competence to act environmentally friendly. The present research measures the action competence outcomes of learners’ sustainability consciousness in Malaysian universities through the ESD action-oriented framework, which comprised five components: action-taking, student leadership, peer interaction, community involvement, and interdisciplinarity. A survey was carried out to examine the perception of 975 students and 458 faculty members. The findings revealed that the ESD action-based pedagogy is implemented and practiced as a key strategy in teaching methods to prepare students to understand and respond to the changing world and drive sustainable development in Malaysia. Moreover, action-based ESD demonstrated the potential to be successful. Although the classroom teaching and learning practices in Malaysian universities benefit greatly from the adoption of the ESD action approach, the action-taking and interdisciplinarity components of the action-oriented framework are shown to contribute to sustainability consciousness. The present study offered a new insight for sustainability practitioners and stakeholders on the action-oriented ESD approach to sustainability consciousness and how it can promote the action competence of learners.

Keywords: sustainable development; pedagogical approach; education for sustainable development; learner outcomes; sustainability consciousness; higher education institutions; universities

1. Introduction

Globally, contemporary policies, research findings, and youth actions have illustrated the relevant role of a sustainable environment in general livelihood although sustainability seems almost unattainable [1] among nations. Environmental concerns are not only contemporary but issues that have been pushed through the global agenda for sustainable development (SD) over the years. However, the concerns for the environment intensified over the last decennia when Chawla and Cushing [2] suggested the dire need to initiate actions to pursue environmental issues making environmental citizenship a global concern [3]. To redress environmental concerns and SD, UNESCO via the United Nation’s Sustainable Development Goals (SDGs), the Sustainable Development Agenda 2030 including its embedded 17 SDGs are ingrained in the ideology that social issues (i.e., poverty, education, health and environmental concerns including climate change, animal well-being, ocean health [4–6]) should be integrated such that they can be concurrently tackled. But how can UNESCO and the world achieve this?

From Carrapatoso [7] perspective, we cannot achieve SD through only political, technological or economic means but by integrating the principles of SD in all educational institutions. In this direction, UNESCO developed the 2030 Roadmap of Education for
Sustainable Development (ESD) with the goal of achieving a more sustainable society by empowering ESD, thus enhancing the attainment of the 17 SDGs [5,6,8]. Diverse studies and researchers contend that the objective of education should go further than only presenting students with knowledge and attitudinal content by training students to become citizens who can take conscious actions to engage in SD [7,9,10]. The multidisciplinary nature of SD makes it difficult to be conceptualized, thus further complicating policymakers and educational institutions’ decisions to take the appropriate actions to address it. However, ESD is identified as the best possible pathway to guiding students to better comprehend SD and acquire the right skills needed to address SD [1,11,12].

As such, Mogensen and Schnack [13] suggested that education must be directed towards motivating and (re)enthusing students to develop SD action competence; which can be cultivated through classroom teaching instructions [14–16]. ESD action-oriented teaching instructions are invariably attributed towards action competence (re)production and are pragmatically discernible actions and attitudes that teachers can incorporate into teaching instructions to motivate students to participate in SD issues [12,17,18]. Although the sustainability literature has debuted heightened implementation programs for ESD [1,10,15], action-oriented teaching instructions or practices are underexplored [1] among higher education institutions (HEIs), whereas practicable action-oriented content is absent in ESD textbooks [19].

In response to the exiguous action-oriented ESD resources, Sinakou, Donche, Boeve-de Pauw, and van Petegem [12] proposed an action-oriented ESD framework directed to be empirically operationalized in attempts to evaluate students’ attitudes and or actions towards SD. The framework constitutes components such as

- Action-taking;
- Student leadership;
- Peer interaction;
- Community involvement;
- Interdisciplinarity (pp. 9–12).

Sinakou et al. suggested that the ESD components enhance the operationality of action-orientation in the classroom teaching instruction and can be tested. However, examining the sustainability literature, there are no accessed empirical findings on the tested ESD framework on HEIs in the Asian context, specifically Malaysia. As such, we examined the presence or absence of action-orientated ESD practices in Malaysian HEIs’ classrooms within the ESD framework using teachers and students’ perceptions. We also examined the impact of the ESD components on the sustainability consciousness (SC), i.e., knowingness, attitude, and behavior) among teachers and students.

2. Theoretical Underpinnings and Model

To achieve SD, education practitioners from diverse fields have suggested assorted viewpoints based on scientific, political and philosophical perspectives [12,20,21] that collectively build a transformative ESD on sociocriticism, constructivism, and behaviorism standpoints that characterize individual knowingness, attitude, and behavior skills, as well as competence. This perspective is directed to develop the action-oriented capacity that strengthens ESD in varying ways to ensure SD effectiveness, both locally and globally [17,22,23].

In view of these different schools of thought, a range of ESD approaches and procedures have been derived from educational traditions to empirically estimate the practices, occurrence or effectiveness of expected outcomes relating to sustainability [24]. The action competence dimension of ESD is aimed at solving SD issues at educational, individual, or group levels is hence proposed and viewed in the sustainability literature as an action that contributes to the development of SD [17,25].

Therefore, Sinakou, Donche, Boeve-de Pauw, and van Petegem [12] developed and conceptualized the action-oriented ESD framework, i.e., action-taking, student leadership, peer interaction, community involvement, and interdisciplinarity (p. 9–12), defining the
action-oriented components that should be addressed during ESD instruction in order to promote action-based sustainable learning.

2.1. Action-Oriented ESD Approach

2.1.1. Action-Taking

ESD emphasizes the capability to take actions [26,27], e.g., an educational field trip may help students acquire information, skills, and the motivation to take action [27]. Teachers should guide students to set achievable goals with measurable outcomes so as to make students action-oriented, and in turn employ critical value assessment strategies to ensure students take actions Chawla [28]. Additionally, students should be educated on the social determinants of environmental problems in order to better understand them and take appropriate action [29]. The goal of education should be conscious acting where students adopt consciousness and action to study ESD [30,31]. For instance, a favorable attitude towards the environment was noticed by Kumler [30] among students who took part in initiatives that included taking action. Therefore, Zint, Kraemer, Northway, and Lim [27] assert that a curriculum devoid of action cannot develop action competence.

Sinakou, Donche, Boeve-de Pauw, and van Petegem [12] cautioned that an activity is variably different from an action in a number of ways, e.g., students could engage in a sustainability project but fail to address the issue’s root causes. For instance, garbage pickup is an activity, while litter avoidance is a goal [32]. When it comes to developing citizens who are willing and competent to participate in community affairs, student involvement becomes critical [13]. Aside from that, sociocultural theories emphasize that knowledge is a social formation that is constantly produced by active involvement in activities in a social environment [33].

2.1.2. Student Leadership

Students’ active participation in their learning is crucial if they are to develop action competence [13,34]. Individuals who take responsibility of their own learning are more successful in coping with SD issues [34]; hence, ESD puts a focus on students taking ownership of their learning—the decisions regarding sustainability problems and initiatives to address SD concerns [35]. Moreover, decision-making takes considerable effort, which is why pupils should be engaged from an early age [36].

Warburton [37] specified that ESD focuses on providing students with a sustainable education that encourages critical thinking and culminates a shift of their world view in terms of knowingness, attitude, and behavior, consequently (re)producing changes in action, implying that students will be more equipped to address SD issues if they take an active part in the SD decision process [38]. In contrast to lecture-based teaching, participatory learning assists students to become more engaged in issues underlying SD. More so, Schelly et al. [39] discovered that when students are given responsibility and a voice in SD decisions, they develop an increased awareness of the environment.

Shier [40] suggested student involvement comprises five levels. At the first level, students pay attention to what the instructor says, are not encouraged, and left to decide to voice their opinions. Level 2 establishes that pupils have the opportunity to voice their opinions as the instructor wants to hear what his or her students have to say. In order to encourage students to express themselves, the instructor must communicate effectively by employing innovative techniques (for instance, through conversations, enquiry reports, art events and visual techniques), or else the opinions of students are ignored or merely heard. Level 3 considers the opinions of students in decision-making but does not imply that all decisions are made with the desires of students in mind since there are numerous variables to consider such as student and instructor opinions.

At this point, students are actively participating in the decision-making process. After consultation comes active involvement in decision-making, and that is what this level is all about. Students have always been encouraged to voice their opinions, but they have not had a significant part in the decision-making process up until now. The instructor is
the one who makes the call. Students and teachers design the scheme program’s activities together at level 4. When students reach the fifth level, they participate in the teacher’s responsibilities and decision-making authority. While students are engaged at the fourth level, they have no actual power; however, at level 5, the instructor is prepared to cede part of his authority to them. In order for kids to share responsibility, it is critical that those duties are both age and developmentally appropriate. As a result, the educator must establish a positive learning atmosphere for her students since it is obvious that ESD’s objectives will be met if the teaching of ESD is geared towards high levels of student involvement (UNO, [41]). However, it can be difficult to incorporate high levels of student involvement in ESD instruction in educational institutions [42].

2.1.3. Peer Interaction

Varela-Losada, Vega-Marcote, Pérez-Rodríguez, and Álvarez-Lires [17] divulged that students in action-oriented ESD education methods remain engaged with each other. In the context of ESD, Jensen and Schnack [43] indicated that working collaboratively is considered essential to action-competency improvement among students since students’ social learning and socially constructed knowledge are enhanced by group work [32,43,44]. Specifically, students may work individually or in groups to resolve SD problems using social learning techniques [45]. Lee [46] argues that varying group work arrangements (whole group, subgroup, and individual) provide opportunities to enhance a variety of attributes in relation to action competence. Wals and Rodela [47] commend the claim that to cope with sustainability problems, people, organizations, and collectives must all be involved. In this direction, we argue that encouraging students to take part in group activities on sustainable development problems provides them with firsthand experience about the mechanisms behind the decision-making procedures and a sense of civic responsibility [47].

2.1.4. Community Involvement

The engagement of the local community and the participation of institutions as well in the civic events both have an effect on students’ ability to take actions. ESD researchers use sociocultural learning theories such as situated learning theory [47] to better understand how students learn, or where Green and Somerville [48] revealed that teachers found significant impact of including community people in their sustainability programs. According to Hogan [49], learning occurs as a consequence of community collaborations and involvement in a professional society. Participation in environmental and sustainability organizations may therefore teach students about taking actions in a sociocultural setting. Students gain civic participation and decision-making skills through participating in community-based methods [50]; hence, people who have a strong feeling of responsibility for the problems in their community are more likely to become involved.

However, studies have suggested that the word "community" is employed differently depending on the context; thus, it is not well defined [51]; so, community may be referring to the immediate educational society (such as parents and neighbors) or to the surrounding area as a whole. Contrastingly, community engagement is seen as including all parties with ties to the institute while dealing with community’s SD problems using a solution-focused strategy.

2.1.5. Interdisciplinarity

Integrating several areas of study enables students to develop competence in addressing sustainability issues [51]. This approach enables students to engage with environmental, economic, and social problems as well as many other disciplines to foster a broader understanding, establish relations, and adopt a holistic approach to resolving issues of sustainable development [52]. Interdisciplinary education may enable students to approach sustainability issues from a number of perspectives [53], which also enhances the action-oriented techniques of ESD.
Teachers are indicated to have difficulty implementing an interdisciplinary approach, inconsistently ingraining the approach in the school’s culture, and consequently often neglect the approach in teaching process [54]. Additionally, teachers have a subject matter legacy [54] that makes it difficult for them to grasp ideas beyond their area [55], although Anyolo, Kärkkäinen and Keinonen [34] claimed that some secondary school teachers favor the inclusion of ESD. On the other hand, some teachers pushed for ESD to be taught as a single subject in order for students to receive more comprehensive knowledge of SD. To achieve SD through interdisciplinarity, Dimenäs and Alexandersson [56], suggest teachers must develop skills to cope with the multidisciplinary difficulty of SD matters.

2.2. Sustainability Consciousness (SC)

As articulated by Ambusaidi and Al Washahi [57], education has a critical role in attaining SD because it changes individuals’ attitude and behavior at both the personal and social levels. They further argue that without education, the objectives of SD are not achievable in any field of life. In this regard, attaining ESD through education embeds SC, i.e., knowingness, attitude, and behavior, which enable students and individuals to resolve problems that originate from non-sustainable factors, thus enhancing (re)production for present and future generations’ economic, social, and environmental remedies [23,31]. We therefore posit that the SC theory of environmental awareness is defined in terms of SD and its three aspects—environmental, social, and economic aspects—which are further broken down into subdimensions to examine sustainability knowingness, attitude, and behavior in more depth [15,58].

2.2.1. Knowingness

Knowingness is different from knowledge [15]. Von Glasersfeld [59] posits that all knowledge theories are related to truth, which cannot be the same in terms of SD due to the multitudinal nature of human thinking. As such, von Glasersfeld suggested the use of the terminology “knowing” instead of ”knowledge”.

Knowingness of SD is an important part of knowing, teaching, and learning in a society [60]. As we attain more knowingness, we get closer to understanding what ESD really means [5]. Sustainability knowingness is thus illustrated as the knowing concerning the foundations upon which SD is built [8]. There is a cognitive and knowledge-based component to sustainability knowingness [5]. When it comes to attitude, it is outlined as the long-term good or negative emotion towards a person, thing, or problem [61], whereas attitude is characterized as intimately linked to values since they may be traced back to certain attitude objects. The definition of SD is that a person’s attitude towards sustainability is determined by how positive or negative they feel about one of the 15 subthemes of the UNESCO-defined sustainability goals [5].

2.2.2. Attitudes

Attitudes comprise the habitual negative or positive emotions of an individual or an issue [15,61]. Interconnected with concrete value and attitude objects, values, on the other hand, are variably different from attitudes, as values are more abstract traits of people. In relation to SD, attitudes become the negative or positive emotionality of people in response to SD. Notably, attitudes are usually constraint to affective areas encompassing both cognitive and behavioral characteristics [15,62].

Although emotional elements and attitude having cognitive and behavioral components [15,61], it is common for attitude measurements to cover larger areas than behavior measurements. To put it another way, the relationship between mindset and actions is not always obvious [61] just as in terms of behavioral reactions, the relationship is still is obscure [15,63]. HEIs learners’ attitude and behavior towards sustainability have been examined in many fields [64–66]; however, there was any direct focus on action-oriented approach as examined in the present study.
2.2.3. Behavior

Attitude and behavior are not distinctly different but are categorically assorted based on their measurement scope. According to Olsson, Gericke, and Chang Rundgren [15], the measurement scope for attitude is always broader and larger than behavior; signifying the difference between the constructs. At the same time, the constructive difference between attitudes are obscure [61], although behavior, comparatively, can be categorized as one’s intention to act, which may not be comprehensively expressed [67]. For the present study, we considered behavior as the intentions of HEI students and teachers to act as examined within the framework of Sinakou, Donche, Boeve-de Pauw, and van Petegem [12]’s ESD framework and the 17 SDGs.

According to Ajzen [68], who based his theory on planned behavior, that attitude only contributes to behavior change when people believe they have adequate procedures to control their actions, which lead them to behave differently in the future. Thus, to foster greater understanding and a more comprehensive development of their sustainability knowingness, it is critical to motivate students to engage in events that entail genuine immersion in what sustainability implies [58].

Therefore, to learn more about SC and how it relates to an individual’s activities in one specific area of SD, we took measurements of their knowingness, attitude, and behavior; the intentions to act on the UNESCO definition of the SD [5,8]. ESD refers to a method for making it easier for educational institutions to adopt and deal with sustainability problems, and the actions of sustainability initiatives could be assessed as the procedure for developing individuals’ capabilities for action orientation [13,15,43].

Environmental, economic, and social aspects are all defined in relation to one another in SC, encapsulating knowingness, attitude, and behavior in ESD action competence with SD content. The impact of an explicit ESD approach should show up as an influence on students’ SC since the notion of SC has been considered to reflect students’ action competence under the light UNESCO’s sustainability idea [5,8]. Moreover, environmental, social, and economic problems, as well as psychological constructs related to knowingness, attitude and behavior are all included in the SC idea. The SC idea was revealed due to its strong relationship with the UNESCO subthemes [5,8], illustrating that citizens must have a greater knowingness of a more positive attitude about, and actions that are in accordance with the principles of SD if we are going to make the transition towards a sustainable future [23,69].

Taking this into consideration, to achieve long-term progress toward UNO’s SD objectives, ESD stakeholders including students and teachers need to acquire good knowingness, attitude, and behavioral skills. The goal of educational initiatives is to provide students with the action competence they need to cope with such important change agents. Understanding action opportunities, believing in one’s own impact, and being ready to act are all important components of action competence [69,70]. As a result, students’ sustainability action competency is reflected in the idea of SC.

The action-oriented approach is portrayed to empower students to adopt an environment friendly lifestyle [71]; thus, the UNESCO’s characterization of sustainability implies that the student’s SC built on an ESD action-oriented approach is a direct consequence and output of sustainability teaching and learning [17,72]. In this regard, an effective occurrence of sustainability education at a large scale, especially its promotion in classrooms, is gaining interest in HEIs because of the policy of the Ministry of Education in light of the Malaysian government’s agenda for 2030, sustainable bright future MoE, 2015; [73,74]. It is therefore essentially necessary to examine the presence or absence of action-oriented ESD practices in Malaysian HEIs’ classrooms within the ESD framework as well as the impact of the ESD components on the sustainability consciousness (SC), i.e., knowingness, attitude, and behavior, among teachers and students of Malaysian HEIs [74,75].

In particular, Malaysian HEIs have been able to construct learning practices that characterize sustainability centered on actions of students to define what graduates should know and practice for a friendly environment since the Ministry of Education placed considerable
effort in implementing the SD agenda in HEIs across the country MoE, [73,75]. Nonetheless, the effectiveness of the action-orientated approach has not been evaluated adequately [75]. Vividly, the assessment of such outreach teaching and learning programs is essentially necessary in attaining SD and requires transformations in the knowingness, attitude, and behavior of students [17], recommending a powerful ESD-based learning atmosphere.

To this end, the cultivation of SC built on students’ action competence is imperative in classes to provide students a good SD grounding [12], and the prerequisites that address the whys and wherefores for the success of the SDGs 2030 agenda set by the Malaysian government as a committed state member of UNO. As such, a critical component of the intervention aspect, i.e., an action-oriented research model, can empirically assess the effectiveness and occurrence of a sustainability action approach, which is the outcome of instructional design in ESD [12]. Based on the operationalized, methodological, and theoretical grounds of Sinakou, Donche, Boeve-de Pauw, and van Petegem [12], this study was carried out to estimate the effects of action-orientation approach of ESD, the outcomes of sustainability teaching, on students’ SC level, i.e., knowingness, attitude, and behavior, through the action-oriented theoretical model (Figure 1). We also tested the action-oriented ESD framework as a pioneering research analysis in the field.

![Theoretical model built on ESD action-oriented approach.](image)

2.3. The Present Study

Over the last decennium, the UNO’s decade of education for sustainable development (DESD) implementation plan classified SD into a three-pillared concept: environmental, economic, and social [76], illustrating why ESD emphasizes SD concerns, such as environmental difficulties, social problems, and economic issues [77]. SD promotes individual and societal wellbeing by promoting economic self-determination and self-development; thus, it instigates many academics in the field of ESD to brand an action-oriented approach as critical to achieving the objectives of SD [12,13,17,25,29,43].

Consequently, an action competence is frequently understood as an approach of ESD to ensure SD in which students respond to or and take the initiatives towards SD problems [13,17,25,32]. An action should be then aimed towards addressing a problem and agreed upon by those prepared to carry out the action. ESD’s goal extends beyond just changing students’ behavior; instead, it aims to empower them with the sustainability information and ability required to make conscious choices in the upcoming life. Action competence, in the perspective of Mogensen and Schnack [13], is the capacity to take action, which is all about being able to have the initiatives to address SD-related concerns, and makes pupils capable of acting at both social and personal levels.
Teachers can deconstruct SD’s complexity through ESD teaching and training instructions since ESD seeks to produce people who are knowledgeable and motivated to live sustainably and take positive action to create a more environmentally friendly society [78,79]. Acknowledging the versatile relevance of ESD across various disciplines, UNESCO proposed the 2030 Roadmap of Education for Sustainable Development (ESD) with the goal of achieving a more sustainable society by empowering ESD, thus enhancing the attainment of the 17 SDGs [5,6]. This global objective transcends all nations, including Malaysia, that are poised to achieve the SD agenda by 2030 by integrating ESD at all levels of education.

However, we focused on the development of ESD at the HEIs in Malaysia, as the sustainability project has been a major focus among Malaysian universities as a means of ensuring sustainable growth (MOE, [73]). A greater number of Malaysian higher institutions such as the Universiti Kebangsaan Malaysia (UKM), Universiti Sains Malaysia (USM), Universiti Teknologi Malaysia (UTM), Universiti Putra Malaysia (UPM), and Universiti Sains Malaysia (USM) have realized SD dynamics, particularly ESD [75] and have adopted key SD content to maximize ESD. Malaysia’s government adapted the UNO’s sustainable development goals (SDGs) for the country’s workforce to reinforce the workforce with knowledge of ESD. In terms of SD awareness, HEIs, especially universities, have been committed to developing ESD knowingness, attitude, and behavior by focusing on teaching and learning in Malaysia [23,74,75]. An individual’s capacity and psychological structure to generate internal representations of external events are both considered to be part of consciousness [80–83]. As a result, conscious awareness complements learning, and students must pay attention to their knowingness, attitude, and behavioral [80,83–86] skills.

Inferred from these circumstances, many of Malaysia’s HEIs have made important steps toward becoming institutions of higher learning focused on sustainability by educating students within the ESD framework to bridge the gap between research and society [87]. As HEIs also (re)produce society’s knowledge and structure, future graduates are required to have a firm grasp of sustainability in order to effectively manage the country. The HEIs in Malaysia offer ESD concerning SD academic programs in various disciplines at both graduate and postgraduate levels in applied science, social science, engineering, and so on. Some institutions and centers use a multidisciplinary approach to ESD teaching and learning training as training trajectories.

From the preceding discussion, we examined the presence or absence of the action-oriented ESD framework proposed by Sinakou, Donche, Boeve-de Pauw, and van Pettegem [12] in HEIs’ ESD programs, and in turn tested the action-oriented ESD framework’s impact on SC, i.e., knowingness, attitude, behavior, using students and teachers’ perspectives, as a pioneering research analysis in the field since the proposed model has not been empirically tested. Our study becomes relevant, as the sustainability literature highlights heightened implementation programs for ESD [1,10,15], whereas action-oriented teaching instructions or practices are underexplored [1] among higher education institutions (HEIs), whereas practicable action-oriented content is revealed to be absent in ESD textbooks [19]. Our study sought to bridge this gap in the SD literature since ESD programs and frameworks have not been empirically tested.

3. Methodological Protocols
3.1. Participants and Procedures

We employed both quantitative and deductive approaches to study the presence or absence of and test the action-oriented ESD framework among HEIs students from four Malaysian universities: UTM, USM, UPM, and UKM. These four HEIs and students at bachelor’s, master’s, and PhD levels provided data for the study on the criteria that the HEI offers ESD programs at levels bachelor, master’s, and PhD, and that the school authorities were willing to allow the students participate in the study. Therefore, all the institutions chosen for the study provided ESD-related course content to students and make ESD a core curriculum content and part of their mission statement at all levels in Malaysia [74,75].
To gather information that was both impartial and accurate, we included a brief statement outlining the respondents’ confidentiality as well as the typical time it would take to complete the surveys. We recruited only students and faculty members who were involved in sustainability courses because the development of ESD at the HEIs in Malaysia as a sustainability project has been a major focus among Malaysian universities as a means of ensuring sustainable growth (MOE, [73]). As a result, a number of Malaysian higher institutions are have realized SD dynamics, particularly ESD [75], and have adopted key SD content to maximize ESD. Consequently, a total of 975 students and 458 instructors were recruited for the study, where the data was gathered using a two-section questionnaire set. First, demographic information such as gender, race (ethnic group), and educational level of respondents was collected; in the second section, questionnaires regarding the study variables were administered.

Due to the COVID-19 pandemic and variations in institutional arrangements regarding study sessions, the data collection took a span of two months. As per university authorities, the questionnaire was randomly shared with more than 1300 students and 650 instructors. Correspondingly, we received the responses of 1034 students and 599 teachers in total. Among them, the valid and usable responses of students (around 75% = 975 students) and teachers (around 70% = 458 teachers) comprised a unit of analysis, i.e., factor of interest. More to the point, assuming that 77% of the subjects in the population have the factor of interest, the study would require a sample size of 459 participants for estimating the expected proportion with 5% precision relative to the expected proportion (i.e., 0.05 × 0.77 = 3.85% absolute precision) and 95% confidence [88]. The detail of demographics is shown in Table 1.

Table 1. Studied demographics.

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students</strong></td>
<td>975</td>
</tr>
<tr>
<td>Male</td>
<td>518 (53.13%)</td>
</tr>
<tr>
<td>Female</td>
<td>457 (46.86%)</td>
</tr>
<tr>
<td>Malay Malaysians</td>
<td>403 (41.33%)</td>
</tr>
<tr>
<td>Chinese Malaysians</td>
<td>311 (31.90)</td>
</tr>
<tr>
<td>Tamil Malaysians</td>
<td>201 (20.62)</td>
</tr>
<tr>
<td>Others</td>
<td>60 (6.15%)</td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>458 (46.97%)</td>
</tr>
<tr>
<td>Master’s</td>
<td>341 (34.97%)</td>
</tr>
<tr>
<td>PhD</td>
<td>176 (18.06%)</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>625 (64.11%)</td>
</tr>
<tr>
<td>Applied Sciences</td>
<td>350 (35.89%)</td>
</tr>
<tr>
<td><strong>Teachers</strong></td>
<td>458</td>
</tr>
<tr>
<td>Male</td>
<td>297 (64.85%)</td>
</tr>
<tr>
<td>Female</td>
<td>161 (35.15%)</td>
</tr>
<tr>
<td>Malay Malaysians</td>
<td>203 (44.33%)</td>
</tr>
<tr>
<td>Chinese Malaysians</td>
<td>112 (24.45%)</td>
</tr>
<tr>
<td>Tamil Malaysians</td>
<td>90 (19.65%)</td>
</tr>
<tr>
<td>Others</td>
<td>53 (11.57%)</td>
</tr>
<tr>
<td>Lecturers</td>
<td>227 (49.57%)</td>
</tr>
<tr>
<td>Associate professors</td>
<td>137 (29.91%)</td>
</tr>
<tr>
<td>Professors</td>
<td>94 (20.52%)</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>283 (61.79%)</td>
</tr>
<tr>
<td>Applied Sciences</td>
<td>175 (38.21%)</td>
</tr>
</tbody>
</table>

3.2. Survey Instrument

The SC tool’s short form, developed by Gericke, et al. [89], was adopted with minor modifications to collect data on students and teachers’ sustainability consciousness. It was used earlier to evaluate the knowingness, attitude, and behavior (components of SC) toward sustainability awareness. The knowingness (i.e., reducing water consumption is
necessity for sustainable development), attitude (i.e., I think that everyone ought to be given the opportunity to acquire the knowledge, values, and skills that are necessary to live sustainably), and behavior (i.e., I have changed my personal lifestyle in order to reduce waste (e.g., throwing away less food or not wasting materials)) were the three segments of the data collection tool to examine the SC of teachers and students.

With the ESD action-oriented approach, the items were taken from the previously used tools and literature [12,13,17,29,30,43,63,89,90]. The instrument contained components of an ESD action-oriented approach such as action-taking (i.e., I always separate food waste before putting out the rubbish when I have the chance), student leadership (i.e., I watch news programs or read newspaper articles to do with the SD obligations), peer interaction (i.e., I work on committees (e.g., the student council, my class committee, the cafeteria committee) at my institutions), community involvement (i.e., I pick up rubbish when I see it out in the public places or in my surroundings), and interdisciplinarity (i.e., I often participate in a number of events arranged by different departments/schools of university).

This section measures the viewpoint of students and teachers relating to the actions-competence where the perception of students and teachers were evaluated on 5-point Likert scale from very rarely to very frequently. Although we adapted questionnaires, tools, items, or statements that were already validated elsewhere, we validated the instruments in the Malaysian context. The Cronbach alpha values for all the constructs of SC and action-oriented components were found to be between 0.80 to 0.87, confirming an acceptable reliability level of the instrument [31,91,92].

3.3. Analytical Techniques and Ethical Consideration

In the present empirical investigation, the analysis was performed using SPSS v.26 and AMOS v.26. We used a variety of statistical techniques to examine students’ and instructors’ perspectives, including exploratory factor analysis (EFA), confirmatory factor analysis (CFA), descriptive statistics, Pearson correlation, and structural equation modeling (SEM). Worth mentioning, EFA and CFA confirmed the validity. Second, the data was checked for normal distribution: skewness and kurtosis values were within the range of ± 2 [93]; missing values and outlier cases were deleted/treated accordingly. The data screening process also ensured the credibility of the data to perform statistical analyses whereas model fit indices thresholds used in this research are \( \chi^2/df < 3 \), CFI > 0.90, TLI = 0.90, RMSEA < 0.08, \( p < 0.01 \) [94,95].

Regarding ethics, the ethical committee of the author(s) gave its approval for this study to be conducted. All of the ethical standards set out by the school or institution were considered. The investigation was also carried out with the consent of the study participants with the condition that participants can withdraw anytime from the study prior to the data analysis. Moreover, participants’ personal details and other data were treated confidentially before, during, and following the analysis.

4. Results

4.1. Preliminary Analyses

4.1.1. EFA

With respect to SC, EFA and principal component analysis with Varimax rotation were run. It revealed that knowingness, attitude, and behavior measures constituted three interpretable separate factors with an Eigen value greater than one. These factors accounted for 64.94% of the total variance. The loading on knowingness ranged from 0.77 to 0.86, the loading on attitude ranged from 0.70 to 0.82, while the loading on behavior ranged from 0.74 to 0.88.

In case of ESD action-oriented approach, EFA revealed that action-taking, student leadership, peer interaction, community involvement, and interdisciplinarity measures constituted five interpretable separate factors with an Eigen value greater than one. These factors also accounted for 67.82% of the total variance. The loading on action-taking ranged from 0.75 to 0.87, student leadership ranged from 0.73 to 0.86, peer interaction ranged
from 0.70 to 0.81, community involvement ranged from 0.70 to 0.84, and interdisciplinarity ranged from 0.77 to 0.89. Hence, it can be concluded that the survey instrument used in this research under consideration is valid.

4.1.2. CFA

Analytically, CFA verified the final factor structure of the three SC constructs under study. The three-factor structure presented a good fit for the data having acceptable fit indices: \( \chi^2/df < 2.89 \), CFI > 0.92, TLI = 0.91, RMSEA < 0.06, \( p < 0.001 \). Worth mentioning, an independent t-test can establish the scale of discriminative power \([96,97]\). All of the factor loadings were significant \( (p < 0.01) \), as it was ranged from 0.72 to 0.84; in all three constructs of SC, the average variance extracted was between 0.72 to 0.80, with composite reliability ranging from 0.75 to 0.86, and \( t \)-values ranging from 63.87 to 89.54, \( p < 0.01 \) were accomplished. Thus, construct validity and reliability were achieved, confirming an acceptable reliability level of the instrument \([31,91,92]\).

Likewise, CFA verified the final factor structure of the five ESD action-oriented approach constructs under study. The five-factor structure presented a good fit for the data having acceptable fit-indices: \( \chi^2/df < 2.79 \), CFI > 0.91, TLI = 0.93, RMSEA < 0.07, \( p < 0.001 \). All of the factor loadings were significant \( (p > 0.01) \), as it was ranged from 0.71 to 0.87; in all five constructs of the ESD action approach, average variance extracted ranged from 0.70 to 0.79, composite reliability between from 0.73 to 0.82, \( t \)-values were from 69.12 to 90.11, \( p < 0.01 \), confirming an acceptable reliability level of the instrument \([31,91,92]\). Thus, construct validity and reliability were achieved; EFA and CFA results including Cronbach alpha values combined indicate that further major analyses can be performed. Hence, the results of EFA and CFA endorsed the effective use of the survey instrument in the present investigation \([95,96]\).

4.1.3. Descriptive Statistics and Correlation

To find out whether an ESD action-oriented approach is present in Malaysian HEIs’ classrooms, we computed the mean scores with standard deviation (SD) for all the constructs. We found that students and teachers both confirmed the substantial presence of an ESD action-oriented approach during their teaching and learning in HEIs in Malaysia. As a proof of concept, the mean scores with SD of all the constructs rated by teachers and students are near enough to point of 5 of the Likert scale (the details are available in Table 2). In addition, mild deviation in SD scores indicates similar viewpoint of teachers and student in HEIs. Correlation among the constructs of the action-oriented approach and SC indicates a moderate to high level of correlations (Table 2). The Pearson correlation results endorsed the adequate association between action competence and SC levels (knowingness, attitude, behavior).

Table 2. Occurrence of ESD action-oriented in HEIs, Malaysia.

<table>
<thead>
<tr>
<th>Construct</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Action-taking</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Student leadership</td>
<td>0.43**</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Peer interaction</td>
<td>0.47*</td>
<td>0.36*</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Community involvement</td>
<td>0.32*</td>
<td>0.31*</td>
<td>0.44*</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Interdisciplinarity</td>
<td>0.53**</td>
<td>0.30*</td>
<td>0.41*</td>
<td>0.46**</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Knowingness</td>
<td>0.60*</td>
<td>0.59**</td>
<td>0.55**</td>
<td>0.65*</td>
<td>0.50*</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Attitude</td>
<td>0.57*</td>
<td>0.63*</td>
<td>0.60*</td>
<td>0.59*</td>
<td>0.48*</td>
<td>0.39*</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>8. Behavior</td>
<td>0.62*</td>
<td>0.68*</td>
<td>0.64*</td>
<td>0.68**</td>
<td>0.55*</td>
<td>0.42*</td>
<td>0.37*</td>
<td>–</td>
</tr>
<tr>
<td>Mean</td>
<td>4.72</td>
<td>4.68</td>
<td>4.68</td>
<td>4.70</td>
<td>4.68</td>
<td>4.64</td>
<td>4.73</td>
<td>4.71</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.33</td>
<td>0.26</td>
<td>0.30</td>
<td>0.26</td>
<td>0.25</td>
<td>0.34</td>
<td>0.29</td>
<td>0.28</td>
</tr>
</tbody>
</table>
### Table 2. Cont.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Action-taking</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>2. Student leadership</td>
<td>0.51 *</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>3. Peer interaction</td>
<td>0.44 **</td>
<td>0.38 *</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>4. Community involvement</td>
<td>0.40 *</td>
<td>0.35 **</td>
<td>0.36 *</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>Teachers</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Interdisciplinarity</td>
<td>0.39 **</td>
<td>0.32 **</td>
<td>0.47 *</td>
<td>0.44 **</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>6. Knowingness</td>
<td>0.63 *</td>
<td>0.63 *</td>
<td>0.60 **</td>
<td>0.64 *</td>
<td>0.59 *</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>7. Attitude</td>
<td>0.55 *</td>
<td>0.66 *</td>
<td>0.59 **</td>
<td>0.61 *</td>
<td>0.65 **</td>
<td>0.40 *</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>8. Behavior</td>
<td>0.59 *</td>
<td>0.62 *</td>
<td>0.63 *</td>
<td>0.60 **</td>
<td>0.58 *</td>
<td>0.36 *</td>
<td>0.32 **</td>
<td>−</td>
</tr>
<tr>
<td>Mean</td>
<td>4.59</td>
<td>4.62</td>
<td>4.66</td>
<td>4.69</td>
<td>4.71</td>
<td>4.68</td>
<td>4.68</td>
<td>4.70</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.29</td>
<td>0.28</td>
<td>0.25</td>
<td>0.30</td>
<td>0.29</td>
<td>0.31</td>
<td>0.32</td>
<td>0.27</td>
</tr>
</tbody>
</table>

*p < 0.01, 2-tailed, **p < 0.05. Only significant coefficients reported.

#### 4.2. Main Analysis

To estimate the action competence, we first established measurement models using CFA separately for students and teachers. Then, structural models were executed for each grade of students and cadre of instructors. The models established the acceptable data-fit: $\chi^2/\text{df} < 3$, CFI $> 0.90$, TLI $= 0.90$, RMSEA $< 0.08$, $p < 0.01$ (Table 3). Hence, the required conditions were met to empirically assess the impact of action-oriented ESD approach on SC, and the effectiveness of the ESD action-oriented framework.

### Table 3. Fit indices for measurement structural models.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Models</th>
<th>$\chi^2$/df</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor’s</td>
<td>Measurement Structural</td>
<td>2.89</td>
<td>0.91</td>
<td>0.91</td>
<td>0.06</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Structural</td>
<td>2.02</td>
<td>0.93</td>
<td>0.94</td>
<td>0.05</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Master’s</td>
<td>Measurement Structural</td>
<td>2.76</td>
<td>0.91</td>
<td>0.93</td>
<td>0.06</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Structural</td>
<td>2.11</td>
<td>0.94</td>
<td>0.96</td>
<td>0.07</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PhD</td>
<td>Measurement Structural</td>
<td>2.54</td>
<td>0.90</td>
<td>0.92</td>
<td>0.07</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Structural</td>
<td>1.98</td>
<td>0.93</td>
<td>0.94</td>
<td>0.06</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lecturers</td>
<td>Measurement Structural</td>
<td>2.63</td>
<td>0.92</td>
<td>0.91</td>
<td>0.07</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Structural</td>
<td>1.96</td>
<td>0.94</td>
<td>0.93</td>
<td>0.06</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Associate Professors</td>
<td>Measurement Structural</td>
<td>2.72</td>
<td>0.92</td>
<td>0.90</td>
<td>0.06</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Professors</td>
<td>Measurement Structural</td>
<td>2.59</td>
<td>0.92</td>
<td>0.91</td>
<td>0.06</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Structural</td>
<td>1.90</td>
<td>0.95</td>
<td>0.95</td>
<td>0.06</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Impact of ESD Action-Oriented Approach on SC

The results of Figure 2 overall corroborated the effectiveness of the research model to empirically measure the action competence. It demonstrated the perspective of students enrolled in bachelor, master, and PhD programs with the standardized regression coefficients (SRC), which are shown in the figure. It was found that SRC vary by degree from program to program, though the results achieved the required level on the scale during SEM analysis. The students from bachelor, master, and PhD programs marked the significantly positive impacts of the components of the ESD action-oriented framework on their action competence, which comprises knowingness, attitude, and behavior on the levels of SC. Likewise, explanatory powers achieved satisfactory estimates on the scale, endorsing the degree of change of each SC factor.
Figure 2. Perspective of students. β values are standardized; * p < 0.01, ** p < 0.05.

On the other hand, Figure 3 illustrated the teachers’ results of different cadres. The SRC values indicating a significant change in the action due to ESD action-oriented teaching practices. Although the SRC values represent different impact size, it is overall effective approach to modify the actions regarding sustainability issues. Moreover, the action-oriented approach of ESD teaching and learning is significant and effective in developing action competence pragmatically. Evidence shows that in the factor variation of SC, due to the components of ESD action-oriented teaching and learning, that the approach substantiates the successful cultivation of action competence concerning sustainability issues. Explanatory powers provided statistical support in this respect.

In light of the SEM analysis results, which demonstrated the perspective of students and teachers, it can be concluded that the theoretical model named ESD action-oriented framework is found to be empirically effective for measuring the pragmatic actions of individuals towards sustainability. In addition, it is obvious that the action-oriented ESD approach can positively the sustainability behavior to ensure SD. In brief, it is an effective ESD approach for nurturing and fostering action competence to address sustainability issues in Malaysia. To such a degree, a U-shaped SC from low to high against the action competence upholds the cultivation conditions of sustainability behavior toward SD issues (Figure 4).
Figure 3. Perspective of teachers. β values are standardized; * \( p < 0.01 \), ** \( p < 0.05 \).

Figure 4. U-shaped relationship between ESD action competence and SC.

5. Discussion and Implications

The purpose of the study was to examine the presence or absence of the action-oriented ESD approach proposed by Sinakou, Donche, Boeve-de Pauw, and van Petegem [12] in HEIs’ ESD programs, and in turn test the action-oriented ESD framework’s impact on SC, i.e., knowingness, attitude, behavior, using students and teachers’ perspectives in Malaysian HEIs. To the best of our knowledge, empirically testing the action-oriented ESD
framework pioneers research in the field of ESD teaching and learning approaches intended to ensure SD. Specifically, the ESD action-oriented theoretical model was empirically tested to determine the impacts of the component ESD action-oriented framework on SC. We also examined the relationships between the variables and the prevalence of the ESD action teaching and learning method in Malaysian HEIs’ classrooms.

Corresponding to the proposed ESD theory of Sinakou et al., (2019), we found that action-oriented ESD impacted HEIs knowingness, attitudes, and behaviors in their classrooms. Thus, this makes the current study the first ever of its kind to test the action-oriented ESD model in an Asian context as well as empirically measure the sustainability outcomes of action competence among adults. These findings bridged the sustainability gap and contributed generally to the sustainability literature, theory, and practice.

Our study distinctively differs from prior ESD studies as we emphasized sustainability awareness [12,23,69,74,75]; knowingness, attitude, and behavior on sustainability action competence. We discussed the findings of the study in two categories: a) the current action-oriented ESD practices in Malaysian HEIs, and b) the impact of action-oriented ESD approach on HEIs knowingness, attitudes, and behavior (action competence).

5.1. Action-Oriented ESD Practices in Malaysian HEIs’ Classrooms

Our findings establish that both students and teachers believe in an ESD action-oriented approach. In response to the UNO [98], Malaysian teachers have really embraced and applied the ESD strategy built on action competence as a teaching method. The strong policy rhetoric (MOE, 2015 [73–75]) seems to have significant impacts on teaching and learning practice in terms of adoption. According to our descriptive statistical findings, the action method of ESD action-taking and interdisciplinarity dimension are being used more often during teaching and learning illustrated by the highest mean scores of five. Furthermore, despite the fact that the UNESCO definition of ESD stresses the importance of action characteristics going hand in hand, our findings indicated medium to high degree associations among constructs of action competence and students’ sustainability outcomes, the levels of SC in terms of knowingness, attitude, and behavior.

In general, it seems that action-taking is a more frequent practice in sustainability theory and practice and that it is inevitably linked to student outcomes [30,63]. Schulz [99] asserts that behavioral modifications impact SD accomplishment; therefore, the action-oriented approach to ESD confirms this assertion as the approach embeds behavioral modification. Interestingly, our study reveals that HEIs employed action-taking in their approach to teaching ESD, suggesting a corresponsive impact on students’ action competence. This infers that teaching and learning in a more pragmatic way led to more sustainable activities, and the usefulness of encouraging students to take actions.

As the action-oriented ESD also embeds value development and enhancement under attitudes and behavior modifications, the findings also indicate that Malaysian HEIs’ students also developed value objectives of attitudes and behaviors; thus, this may have implications for action-taking towards SD. Chawla [28] and Sinakou, Donche, Boeve-de Pauw, and van Petegem [12] confirmed that individual values are relevant to developing capabilities for action-taking among students. Such practices confirm the implementation of action-oriented ESD practices in HEIs; hence, they (re)produce SC development within classroom settings, consequently affecting the ESD political and educational philosophical paradigms in Malaysia [31]. Malaysian HEIs’ practicing of the action-oriented ESD approach draws our attention towards the effective utility to cultivate action orientation amongst students to live sustainably in response to the UNO’s policy, particularly the strong rhetoric of the ESD movement at the Malaysian governmental policy level.

5.2. Impacts of ESD Action-Oriented Approach

The SEM analysis shows that when teachers integrate the components of action-oriented ESD approach, it impacts students’ comprehension of the SD’s complexity, thus boosting their knowingness, attitudes, behavior towards SD. This denotes the pragmatic
increase in action competence among HEI students’ knowingness, attitude, and behavior towards both global and national SD movements. This finding suggests that Malaysian HEI teachers and students play a significant role in ESD toward ensuring SD in Malaysia and beyond by embracing knowingness, attitude, and behavior to improve SD action competence. Thus, it further connotes that HEI teachers and students acknowledge sustainability problems, i.e., environmental, social, and economic aspects, as well as their past, present, and future, at their local, regional, and world levels (MOE, [5,8,73]).

The SEM findings also established that when teachers employ the action-taking and interdisciplinary components of the action-oriented ESD approach in their teaching approaches, sustainability outcomes of students increase. This finding is supported by prior studies that show that action-taking enables teachers to employ empirical activities in classroom settings that guides students to learn how to resolve particular issues, i.e., enabling students to attain context-specific knowledge of SD issues. The interdisciplinary attribute of the approach is also indicated to facilitate students’ engagement in and with social, environmental, and economic problems in ways that become trajectories to comprehending SD issues from a holistic perspective [12,52,100]. It therefore does not come as a surprise to observe the impact of an action-oriented approach on the SD outcomes of Malaysian HEI students.

ESD’s action-taking and interdisciplinarity influencing students SD outcomes implies that the components (re)enforce active participation in classes, allowing students to choose teaching and learning contents related to the issues they face about decision-making and leadership practices, where their views are required to critically reflect on what is being taught about sustainability. An ESD action-oriented strategy is still green to empirical research and those who have tried it in other ways have occasionally shown detrimental impacts [15,74,75]. The current findings therefore contradict prior findings by being first of a kind in the action-oriented ESD research area.

Thereupon, our findings and unique analytical approach represent a significant advancement in the action-oriented ESD research approach since they demonstrate the effectiveness of the ESD action approach. Hence, we contribute to the DESD literature with empirical evidence to support ESD implementation efforts in the context of HEIs in Malaysia.

However, Kopnina [101,102] contended that emphasizing economic and social problems would cause students to adopt anthropocentric worldviews and therefore renounce environmental values due to eco-centrism; we refute this claim due to the deductive and cogent nature of the SD epistemology. Apparently, we suggest that students become more action-oriented when they undertake ESD teaching and learning instructions to maximize SD outcomes. Herein, we can argue that ESD action-oriented teaching and learning are effective and promote the development of greater awareness of sustainability among students.

The U-shaped graph calls to certify the importance of direct and indirect actions that enhance sustainability, suggesting that both direct and indirect acts should be included in planning SD activities to effectuate the impact of the action-oriented ESD approach. Direct activities seek to address the SD issue that students struggle with while indirect actions influence others to do the same, including indirect measures, such as educating the local population or putting pressure on government officials, or by taking urgent action. Other examples of direct action may comprise trash sorting, compost heap building, water and energy conservation, the distribution of leaflets or newspapers, as well as writing letters to politicians or businesses, are all instances of indirect action [32,43]. All of these are imperative to sustaining SD and thus are present and influential in an action-oriented ESD approach, implying that students who learn from the said approach are more likely to adopt to and employ one or more direct and or indirect measures to maximize the objectives of sustainable living. In so doing, students in turn become responsible for their own sustainability attitudes and behaviors, (re)enforced by the action-oriented ESD empirical learning project [12,34].
From the preceding discussion, we can argue that institutions and communities are connected in four modes [90,103]. As a part of the ESD curriculum, students engage in simulative activities such as role-playing, reading newspapers, or engaging in community issues comprising mode 1. When a school invites member of the local community to discuss action choices, it takes the first step toward establishing a link between involved parties, i.e., schools and society, which makes up mode 2. The third mode involves certain instances where kids may choose to quit school and explore their options in the community, while the fourth mode constitutes the state where students experience the physical existence of the society in the institutions as they (students) are actively engaged and thus may serve as social agents.

On the other hand, Bascopé, Perasso, and Reiss [51] also proposed that society can participate in schools’ SD outcomes through: (i) learning about and from a society where they are living by participating in community events and communication with the members of the society; (ii) taking action on community issues in a struggle to manage the issues regarding SD; and lastly (iii) cooperating with the community to learn about and solve SD-related problems collaboratively. These three modes of community involvement complement the SD of students [51], thus improving their outcomes overtime, and are distinct from individual-level SD practices.

Steg et al. [104] indicated individual-level activities linked to SD problems should be carried out in the private and public spheres, respectively; due the complexities of SD problems, collaborative action is suggested to be more effective. More to the point, the private life remedies to SD problems should avoid presenting simple reasons and answers at the individual level [32]. For instance, switching off the tube lights while leaving the classroom exemplifies an action, which may influence others to act in similar ways in the future. As such, the teaching and learning of ESD should not be restricted to individual or school-level activities, but rather should extend to communal ones [43] to have students experience real time interactions with and exposure to SD practices in community sustainability events.

6. Conclusion, Contributions, and Limitations

The action-oriented ESD approach aims to improve students’ ESD sustainability teaching and learning with the goal of maximizing action competence among students’ SD outcomes. The present study is a novelty that address the absence of empirical evidence on the relation between an action-oriented ESD approach and ESD theory and practice. This study addresses multidisciplinary and SD dynamism by providing evidence on action teaching and learning of sustainability issues at HEIs in Malaysia. Due to the scarcity of empirical evidence of action-oriented ESD in the literature, the implementation of the ESD action approach becomes a significant research area in teaching and learning of sustainability.

We found that the relationship between the action-oriented ESD approach and HEI students’ sustainability consciousness closely related to UNESCO’s ESD conceptualization. It is therefore relevant to enhance students’ SD awareness in action-oriented ESD classrooms to complement UNESCO’s SD efforts, so as to reinforce the achievement SC among students. Unsurprisingly, we further found the significant impacts of the ESD action orientation on students’ SC outcomes, i.e., knowingness, attitude, and behavior. Although all the components of the ESD approach (action-taking, student leadership, peer interaction, community involvement, interdisciplinarity) contribute to student outcomes, action-taking and interdisciplinarity aspects have a substantial impact on SC.

The implementation of the ESD action strategy is largely dependent on policy recommendations; these findings provide significant foreground for policymakers and educational instructors to consider the adoption of the ESD action approach in attempts to fulfill the objectives of DESD in order to maximize the effective implementation of the sustainability agenda of the UNO in Asia, particularly in Malaysia. This empirical piece of research provides important information to institutions and stakeholders to assess the
ESD action competence cultivation efforts to ensure SD. While our findings indicate that although ESD attained potential success, the findings also demonstrate that there is no one-size-fits-all answer and that instructional practices must be tailored to the context of the students.

Pragmatic and pedagogical implications of these findings may include but are not limited to HEIs planning ESD instructional content based on the context of the students and discipline, as well as the particular SD phenomenon to be examined and resolved. For schools to benefit from these strategies, policymakers and institutional organizers may plan a context-specific ESD curriculum or teaching instructions with elements of the action-oriented ESD approach, while emphasizing contextual SD activities and problems in their area of discipline. For instance, SD content in the social science discipline may relatively differ from a health discipline with each focusing on subject-specific content.

Irrespective of the significant findings discussed, our study was met with some limitations. Like prior studies, we could not measure how much students’ environmental awareness aids them in overcoming social obstacles such as consumerism [105]. This has been a steady limitation to empirical ESD action studies over time, hence requiring further investigation. We therefore recommend future research measure the value of environmental awareness that accounts for students’ success over social consumerism to set a smooth platform for ESD researchers and practitioners.

Our study mainly relied on the self-reported action orientation of HEI students’ practices on a broader level, i.e., local, regional, national, and international; otherwise, the value of ESD action approach effectiveness would have been measured, because SD is unlikely to be achieved if students are unable to pragmatically act by putting their sustainability awareness into practice.

In sum, we assert that empirically testing the impact of an action-oriented ESD approach on students’ SC, i.e., knowingness, attitudes, and behavior, has contributed new knowledge to the ESD literature and sustainability at large. Nonetheless, the findings demonstrate that ESD has potential to be successful, and the critical role that action-oriented ESD may play in tackling SD, which may have implications for a sustainable future.

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