DEVELOPMENT OF A PREDICTION MODEL OF ENVIRONMENTALLY-SUSTAINABLE BEHAVIOUR AMONG PRE-SERVICE TEACHERS IN THE MALAYSIAN INSTITUTE OF TEACHER EDUCATION

By

AINI ARIFAH BINTI ABDUL KARIM

Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

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DEDICATION

This thesis is dedicated to

My late parents:
Al-Marhum Prof. Dr. Haji Abdul Karim Haji Tajudin
Al- Marhum Puan Hajah Latifah Redah

Parents in law:
Al-Marhum Haji Mohd Amin Abdul Aziz
Puan Hajah Khatijah Mohamad

My husband:
Mohd Irfan Mohd Amin

My lovely kids:
Khairin Athirah Mohd Irfan
Khalif Safwan Mohd Irfan
Khair Wafiy Mohd Irfan

My siblings:
Dr. Aini Afifah Abdul Karim
Ahmad Azizi Abdul Karim
Amir Azlan Abdul Karim
Dr. Anwar Azhari Abdul Karim

With love, respect and a bunch of memories
Indeed, we belong to Allah and indeed to Him we will return.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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July 2021

Chairman :Ho Yuek Ming @ Sabrina J. Ho Abdullah, PhD
Faculty :Forestry and Environment

The inclusion of ESD in pre-service teacher education programmes is crucial in terms of preparing today's teachers for long-term success since teacher education is a critical component of ESD policy adoption and implementation. More importantly, little is known about the factors that determine the environmentally sustainable behaviour among the pre-service teachers, specifically in Malaysia Institute of Teacher Education (ITE). All the 27 campus of ITE in Malaysia are branded as 'Sustainable ITE' adopting the Eco-Schools programme which aspires to empower pre-service teachers to take action to find solutions to environmental issue in their campus area. Therefore, the main purpose of this study is to develop a preliminary predictive model on factors determining environmentally sustainable behaviour among pre-service teachers by integrating two theories; Theory of Planned Behaviour (TPB) and Model of Environmentally Responsible Behaviour (ERB). The development of the new ESB model was applied using a deductive theory-generating research approach and a correlational research design. Seven variables were examined, namely sustainability action skills (SAS), knowledge on sustainability strategies (KSS), knowledge on sustainability issues (KSI), environmentally sustainable attitude (AT), subjective norm (SN), perceived availability of facilities (PAF) and environmentally sustainable behaviour intention (BI). This study also determined the moderating role of field of study and Environment Education course on the relationship between key predictors and environmentally sustainable behaviour. PLS-SEM was applied to capture the causal effect relationship model of these relationships. The population of this study includes 5 randomly selected Institute of Teacher Education employing a stratified proportional sampling technique. The respondents (n = 256) answered the face-to-face questionnaire survey.

The model's testing results revealed that out of 13 path coefficients (β) in the structural model, 8 paths had statistically significant direct effects on the interrelationships, while

five path did not have any significant effect. The paths that showed significant effects were: BI, SAS, KSS, AT, SN, and PAF on environmentally sustainable behaviour; KSI and SN towards environmentally sustainable behavioural intention. The path with non-significant effects was the KSI, towards environmentally sustainable behaviour and SAS, KSI, AT and PAF towards environmentally sustainable behavioural intention. Furthermore, this study also examined the field of study and Environment Education course as moderating variables for the model. In addition to the path coefficients (direct effect relationship), the structural model also revealed 1 coefficient with significant moderating effects out of 12 for the interrelationships among the key predictors and the environmentally sustainable behaviour investigated in the study. The moderating effect was observed for Environment Education course in the relationship between knowledge on sustainability strategies (KSS) and environmentally sustainable behaviour. Overall, the structural model explained about 74.9% of the variance in the environmentally sustainable behaviour of the pre-service teachers in the ITE. In conclusion, this study verifies that environmentally sustainable behaviour intention, sustainability action skills, knowledge on sustainability strategies, attitude, subjective norm and perceived availability of facilities have a major impact on the environmentally sustainable behaviour. The study contributed significantly to the literature by indicating TPB and ERB as the ideal framework to capture the environmentally sustainable behaviour among pre-service teachers who are in their training. Additionally, this study suggests that the predictive model developed should be suitable to be used for predicting the environmentally sustainable behaviour of future teachers in the Malaysian Institutes of Teacher Education as well as other public universities and other developing countries in the hope of nurturing and cultivating positive behaviours towards mother nature, so as to achieve a more sustainable future for the next generation.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PEMBANGUNAN MODEL RAMALAN TINGKAH LAKU KELESTARIAN ALAM SEKITAR DALAM KALANGAN GURU PRA PERKHIDMATAN DI INSTITUT PENDIDIKAN GURU MALAYSIA

Oleh

AINI ARIFAH BINTI ABDUL KARIM

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Penerapan ESD dalam program pendidikan guru pra-perkhidmatan adalah penting dari segi menyediakan guru untuk kejayaan jangka panjang memandangkan pendidikan guru merupakan komponen penting dalam penerimaan dan pelaksanaan dasar ESD. Lebih penting lagi, kajian mengenai faktor yang menentukan tingkah laku lestari alam sekitar dalam kalangan guru pra-perkhidmatan amatlah sedikit, khususnya di Institut Pendidikan Guru Malaysia (IPG). Kesemua 27 kampus IPG di Malaysia dijenamakan sebagai ipg IPG Lestari' di mana kampus-kampus ini mengamalkan program *Eco-Schools* yang berhasrat untuk memperkasakan guru pra-perkhidmatan dalam penyelesaian isu alam sekitar di kawasan kampus mereka. Oleh itu, tujuan utama kajian ini adalah untuk membangunkan model ramalan awal tentang faktor-faktor yang menentukan tingkah laku lestari alam sekitar dalam kalangan guru pra-perkhidmatan dengan mengintegrasikan dua teori; Teori Tingkah Laku Terancang (TPB) dan Model Tingkah Laku Bertanggungjawab terhadap Alam Sekitar (ERB). Pembangunan model ESB ini telah menggunakan pendekatan penyelidikan penjanaan teori deduktif dan reka bentuk penyelidikan korelasi. Tujuh pembolehubah telah dikenal pasti iaitu kemahiran tindakan kelestarian (SAS), pengetahuan tentang strategi kelestarian (KSS), pengetahuan tentang isu kelestarian (KSI), sikap lestari alam sekitar (AT), norma subjektif (SN), persepsi ketersediaan kemudahan (PAF) dan niat dalam tingkah laku lestari alam sekitar (BI). Kajian ini juga menentukan kesan penyederhana bidang pengajian dan kursus Pendidikan Alam Sekitar terhadap hubungan antara peramal utama dan tingkah laku lestari alam sekitar. PLS-SEM telah digunakan untuk menghasilkan model ramalan ini. Populasi kajian ini termasuk 5 Institut Pendidikan Guru (IPG) yang dipilih secara rawak menggunakan teknik persampelan berstrata. Responden (n = 256) telah menjawab soal selidik tinjauan secara bersemuka.

Hasil keputusan ujian model mendapati bahawa daripada 13 pekali laluan (β) dalam model struktur, 8 laluan mempunyai kesan langsung yang signifikan secara statistik ke

atas perhubungan, manakala lima laluan tidak mempunyai sebarang kesan yang ketara. Laluan yang menunjukkan kesan ketara ialah: BI, SAS, KSS, AT, SN, dan PAF terhadap tingkah laku lestari alam sekitar; KSI dan SN ke arah niat tingkah laku lestari alam sekitar. Laluan yang mempunyai kesan tidak ketara ialah KSI terhadap tingkah laku lestari alam sekitar dan SAS, KSI, AT dan PAF terhadap niat tingkah laku lestari alam sekitar. Seterusnya, kajian ini turut mengkaji bidang pengajian dan kursus Pendidikan Alam Sekitar sebagai kesan penyederhana bagi model tersebut. Sebagai tambahan kepada pekali laluan (hubungan kesan langsung), model struktur juga mendedahkan 1 pekali dengan kesan penyederhana yang ketara daripada 12 hubungan antara peramal utama dan tingkah laku lestari alam sekitar yang dikaji. Dari segi kesan penyederhanaan, kajian ini mendapati bahawa kursus Pendidikan Alam Sekitar memberi kesan penyerdahana antara pengetahuan tentang strategi kelestarian (KSS) dengan tingkah laku lestari alam sekitar. Secara keseluruhannya, model struktur ini menjelaskan kira-kira 74.9% varians dalam tingkah laku lestari alam sekitar dalam kalangan guru pra-perkhidmatan di IPG. Sebagai kesimpulannya, kajian ini mengesahkan bahawa niat tingkah laku lestari alam sekitar, kemahiran tindakan kemampanan, pengetahuan tentang strategi kemampanan, sikap, norma subjektif dan persepsi ketersediaan kemudahan mempunyai kesan besar ke atas tingkah laku lestari alam sekitar. Kajian ini menyumbang secara signifikan kepada literatur dengan menunjukkan TPB dan ERB sebagai rangka kerja yang ideal untuk menerangkan tingkah laku lestari alam sekitar dalam kalangan guru pra-perkhidmatan yang sedang menjalani latihan mereka. Selain itu, kajian ini mencadangkan bahawa model ramalan yang dibangunkan harus sesuai digunakan untuk meramalkan tingkah laku lestari alam sekitar bakal guru di Institut Pendidikan Guru Malaysia serta universiti awam lain dan negara-negara yang sedang membangun dengan harapan ia dapat memupuk sikap positif terhadap alam semula jadi, demi untuk mencapai masa depan yang lebih mampan untuk generasi akan datang.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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Date: 10 February 2022

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LIST OF ABBREVIATIONS

AMOS	Analysis of Moments Structure
AVE	Average Variance Extracted
DESD	Decade of Education for Sustainable Development
EE	Environment Education
EPRD	Education Planning and Research Division
ERB	Environmentally Responsible Behaviour
ESB	Environmentally Sustainable Behaviour
ESD	Education for Sustainable Development
HEI	Higher Education Institution
IHL	Institute of Higher Learning
IPG	*Institut Pendidikan Guru*
ITE	Institute of Teacher Education
MOE	Ministry of Education
NEP	New Ecological Paradigm
NGO	Non-Government Organisation
NREB	National Resources and Environment Board Sarawak
PEB	Pro-environmental Behaviour
PLS-SEM	Partial Least Square Structural Equation Modelling
SD	Sustainable Development
SDG	Sustainable Development Goals
SEM	Structural Equation Modelling
SPSS	Statistical Package for Social Sciences
SSE	Sum of Squares Error

SST	Sum of Squares Total
TPB	Theory of Planned Behaviour
UN	United Nation
UNEP	United Nation Education Program
UNESCO	United Nations Educational Scientific and Cultural Organization

CHAPTER 1

INTRODUCTION

1.1 Research Background

The preservation of nature and man can never be separated. Indeed, it is undeniable that humans are responsible for every action taken against the environment. Ecosystems and humans complement each other in balancing life. Therefore, we value the environment by preserving and conserving it. In parallel with that, every development done by human beings should consider the environmental impacts, to minimise the environmental effects to achieve sustainable development. Sustainably designed development to meet non-desirable needs or profits can reduce the rate of damage to the earth. Environmental problems have always been a serious issue. The high increase in population is causing many resources needed to accommodate people's lives and consumption.

The continuing growth in population as well as urbanization is projected to rapidly add 2.5 billion people to the world's urban population by the year 2050 (United Nation, 2014). Now, the world has reached 7.6 billion people. With this increase, the use of natural resources will increase and the rate of waste is expected over 40 percent of the total existing natural resources (Baniah Mustam, 2015). Industrial development and the process of urbanization also lead to uneven distribution of development thus creating environmental problems. The use of natural resources, logging trees, residential buildings, planting of plants for the necessities of life has slightly changed the environment. The welfare of human life requires good economic growth. Production activities and economic growth are the cause of the occurrence of environmental degradation.

The deterioration of environmental quality stems from the human desire to develop the nation but instead, it disrupts the nature of the environment (United Nations Department of Economic and Social Affairs, 2013). Economically, Malaysia, as a wealthy developing country, is growing rapidly with the manufacturing industry, especially electronics, chemicals, and rubber. But rising production rates causing an increase in the release of organic gas pollution, chemicals, and dust instead (Aja, Al-kayiem, Zewge, & Joo, 2016).

Therefore, it is inevitable that Malaysia shall face environmental issues and the extinction of resources. As a developing country, land development activities and projects involving the opening of new settlements and farms, logging, construction of physical infrastructures such as roads, urban development, and construction of physical projects such as housing and industrial are not unusual. All these activities create a problem of soil erosion that pollutes the river water in terms of suspended matter, colour, turbidity, organic matter and problems river sedimentation. Consequently, a large number of human wastes including domestic, industrial, commercial, and transportation

waste finally end up in the water. A great number of rivers are actually greatly polluted to the extent that they cannot be recovered. (Yuk Feng Huang, Shin Ying Ang, 2015)

Besides that, air pollution in this country can be considered as dangerous. This applies largely due to human activity. Department of Environment (2013) reported 4,611 open burning cases detected in 2013 where 858 cases involving agricultural areas, 739 forest burning cases and 640 cases involving bush burning. Other open burning involves burning rubbish in housing and burning areas for activities, such as religious or worship. In addition, air pollution is also a result of smoke emissions and pollutant gases such as carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NOx) and particulate released through the exhaust of motor vehicles where at the end of 2013 only a total of 23,705,794 motor vehicles have been registered in Malaysia. Researchers are of the view that many of the events that occurred were from uncontrolled activity, negligence, greed, lack of self-awareness, and selfishness. Besides, it is also caused by non-conceptualized development in sustainable development, the lack of laws involving consumer protection as well as weak enforcement of these laws resulting in a lack of protection for a pristine environment.

One of the most significant current discussions in moral philosophy is that the quality of human life is determined by attitude and personality traits embedded in the individual. Education is an alternative to instilling an awareness of the environment (Zanaton Iksan, 2015). This is because the formation and active involvement of each community member towards the environmental issues are clear from education. Environmental education is said to be important in increasing awareness of environmental quality (Monroe et al., 2016). Future generations can control and add prosperity to their lives and future through environmental education (Baniah Mustam, 2015).

In fact, unplanned development activities and negligence towards the environmental aspects also threaten the future of future generations. It is undeniable that this situation is very serious and affects the independence, sustainability of civilization and prosperity (Arora et al., 2018) . Increasing understanding, and environmental awareness are two important elements in building national capacity towards sustainable development (A. Hassan, Osman, & Pudin, 2009) . Hence, this study is one of the efforts to identify the implementation of sustainable development education in the national education system and its impact on society.

It is inevitable that the responsibility to inculcate awareness and consciousness towards the environment is not only directed towards the green activists or environmentalists, but also to all stages and levels of society. Hence, teachers are seen as effective agents of change to mobilize the concept of education for sustainable development (Hanifah, Shaharudin, Mohmadisa, Nasir, & Yazid, 2015).

Furthermore, this study includes the need to foresee the transitioning of the general environmental education, to issues of environmentally sustainable behaviour. Because of the growing number of environmental concerns caused by human behaviour, pro-

environmental behaviour has become a hot topic in environmental sustainability study. (Blok, Wesselink, Studynka, Kemp, 2015). Individuals who practise pro-environmental behaviour aim to take measured actions to promote constructive changes in the environment and limit the impacts of human neglect. (Carmi, Arnon, Orion, 2015). Individuals may not pursue pro-environmental behaviour despite its relevance owing to a variety of factors such as time, expense, and effort. Individuals' intentions to be environmentally friendly may be influenced by their views, motivations, and environmental commitment. (Khare, 2015). Furthermore, highly educated persons with extensive environmental awareness and drive are more likely to engage in this responsible behaviour. (Chakraborty, Singh, Roy, 2017). Most individuals' self-identity and biospheric values may drive them to engage in pro-environmental behaviour. (Ruepert, Keizer, Steg, Maricchiolo, Carrus, Dumitru, Mira, Stancu, Moza, 2016). Besides, pro-environmental behaviour is mostly affected by factors such as environmental commitment (Han &Hyun, 2016), pro-environmental or green lifestyle lifestyle (Mohd Suki, 2016), self-efficacy (Huang, 2016) and environmental awareness or consciousness.

Therefore, individual behavioural change may be easily cultivated among current generations, hence colleges, universities, and training centres play an important role in developing pro-environmental behaviour. (Massaro, Dumay, Garlatti & Dal Mas, 2018 & Ting & Cheng, 2017).

As a result, in order to achieve the sustainability goals, people's individual environmental behaviours must be cultivated initially at an early age. Students should practise pro-environmental behaviour since they will be exposed to the effects of environmental challenges in the future and can help to spur environmental activities. (Vicente-Molina, Fernandez-Sainz, Izagirre-Olaizola, 2013). In this respect, this research took place in several Institute of Teachers Education (ITE) in Malaysia which aims determine whether the environmentally sustainable behaviours performed by the pre-service teachers were derived from their own initiatives in performing pro-environmental behaviour or were prompted by the programs conducted in the campus. Thus, the focus was on pre-service teachers' awareness on environmentally sustainable behaviour as voluntarily performed based on their awareness that emerged as an impact of the environment education program that they have been part of, or merely behaving pro-environmentally as part of the rules and regulations set by the ITE to conserve and preserve the campus surrounding.

1.2 Sustainability Education

Environmental education in schools is typically at the centre of improving the national education system, as it raises awareness of the urgency of environmental conservation and addressing pollution. The current Malaysian curriculum raises concerns about whether climate change and sustainable development issues are being addressed in current environmental education in order to create awareness and encourage positive behaviour toward environmental conservation in Malaysia. (Kamaruddin, Othman, Md Sum & Abdul Rahim, 2019). According to Kamaruddin et. Al (2019), There seems to be no specific subject on environmental education in Malaysian school curricula, resulting

in poor public awareness and civic consciousness on environmental conservation and preservation, as well as a lack of understanding and exposure to various issues on sustainability and environment, knowledge on sustainable environment, and any updated information on environment. As a result, environmental education in Malaysia must be examined to determine that knowledge of environmental protection from all perspectives, including legislation and policies, is incorporated in the latest educational syllabus.

Sustainability is a notion in product, commodities, and service development that entails fulfilling current demands without jeopardising future generations' capacity to meet their own needs. The idea of sustainability recognises that the environment is a finite resource. As a result, it is critical to use the environment and its resources wisely and to conserve them for the sake of the Earth, mankind, and all living creatures. For this particular research, an emphasis is being made to study the factors affecting environmentally sustainable behaviour. Human beings as individuals as have a moral duty to each other, future generations, and other species to keep the world alive, regardless of who we are, where we live, or what we do. Our current decisions and behaviours have far-reaching long-term consequences for future generations. Environmentally sustainable behaviour guarantees that we make ethical decisions that ensure everyone has a secure and liveable future (Mensah, 2019). Future generations will be deprived if we exhaust the Earth's resources. This study fits into the current body of knowledge by the development of the predictive model, using the Theory of Planned Behaviour as well as the Model of Environmentally Responsible Behaviour, that is discussed further in the next chapters. At the same time, this study is investigating what are the factors that influence the pre-service teachers to behave sustainably, and if it is possible to encourage and empower environmentally sustainable actions.

1.3 Sustainability Education in Institute of Teacher Education

The Institute of Teacher Education Division, which is part of the Ministry of Education (MOE), is a fundamental foundation that fully monitors ITE. They had assigned full responsibility for developing and preparing the programmes, curriculum, modules, and syllabus for the ITE courses. The Institute of Teacher Education Division frequently holds seminars, courses, and training for lecturers to ensure they are on the right path and are aware of changes in syllabus, modules, and so on. IPG-Lestari programme, which is being introduced a joint venture with Institutes of Teacher Education Malaysia, MOE (headquarters) in all the 27 Institutes of Teacher Education in Malaysia, is expected to offer a better understanding as to how future teachers should identify environmental issues and work on solutions by collaborating (plan their actions, get the whole institute involve, generating interest, work with external agencies) with broader audience within the educational institutes as well as with local communities. As a result. All the 27 Institutes of Teacher Education in Malaysia were branded as 'Sustainable ITE' starting in 2012. Nevertheless, the Malaysian Institutes of Teacher Education Division, MOE plays an integral part to boost environmental awareness among trainee teachers, in order to prepare themselves mentally and physically due to teach in schools in future as well as providing an environmental learning climate among the trainees during their studies at ITE. At the same time, producing teachers who aware of environmental issues, by

applying the concept of learning about environment, for environment and through environment. This study is looking into how the pre-service teachers' behaviour changed to the better after receiving a substantial amount of exposure on environmental sustainability and how they will integrate their environmentally sustainable behaviour into teaching the young students in the future. Problems occurred while implementing environmental sustainability in schools such as having less knowledge about environmental and sustainability among teachers is addressed in this research.

1.4 Problem Statements

This study aims at an in-depth understanding of the issue of environmentally sustainable behaviour. This problem has received substantial interest in educational contexts from many scholars. Many researchers and academicians around the world have been interested in the role of education, particularly teacher education, in promoting sustainable living and development over the last two decades or so (Alvarez-Garca et al., 2018; Kalsoom and Khanam, 2017; Kalsoom et al., 2017; Merritt et al., 2019; Tomas et al., 2017; UN, 2015). Individuals' capacity to conduct in a more sustainable manner can be built through ESD by expanding their knowledge, skills, and abilities (Longhurst et al., 2014; Merritt et al., 2019).

Teachers' ability will always be a topic of scholarly debate, as the effectiveness of the teacher has a significant impact on students' learning and accomplishment (Darling-Hammond, 2017; Kearney and Garfield, 2019; Laurie et al., 2016). Effective teacher development programmes, according to Darling-Hammond (2017), are the key to teacher effectiveness. As a result, pre-service teachers' professional development should be centred on effective ESD implementation and children's development. (Faulkner et al., 2017; Mckeown, 2014). Teacher education serves to professionalise the teaching profession, improve student learning and growth, and promote ESD (Al- Zboon, 2016; Faulkner et al., 2017; Mckeown, 2014). Teachers' education has remained a critical component in achieving the Sustainable Development Goals (SDGs) set forth by the United Nations (Leal Filho et al., 2018). UNESCO (2014) stressed teacher education as a critical component of ESD policy adoption and implementation. ESD is strategically important in terms of preparing future instructors who will be able to educate others for long-term growth (Ferreira et al., 2007). As a result, the inclusion of ESD in pre-service teacher education programmes is crucial in terms of preparing today's teachers for long-term success. Unfortunately, the majority of teachers are uninformed about sustainability, and most teacher education/training institutes do not provide any curriculum to help them improve their sustainability expertise (Merritt et al., 2019). Teachers have a critical role in the evolution of schools and society as a whole (Ferreira et al., 2007). A well-planned and well-established process of learning that may lead to meaningful reform in people's thoughts is required to allow social transformation and attainment of SD (Gs) (Bürgener and Barth, 2018).

ESD delivers a well-thought-out and well-established foundation for raising individual awareness, strengthening their decision-making abilities, and acting sustainably (Laurie et al., 2016; Pigozzi, 2007). It is a well-known fact that ESD provides the necessary

learning process to spark social transformation, and numerous educational institutions have implemented projects ranging from school gardens to sustainability certification to change people's attitudes (Van Poeck, Konig, and Wals, 2018). Education, according to Bokova (2015), is essential for achieving sustainable development since it has a huge impact on how people think and act. Many reports published under the auspices of the United Nations and its sister organisations, such as UNESCO, have emphasised the importance of education, specifically teacher education, in ensuring a sustainable future (Huckle and Wals, 2015; UNDP, 2015; UNECE, 2013; UNESCO, 2014; Vladimirova and Le Blanc, 2016).

This study depicted that Malaysia is still facing quite a challenge in achieving sustainable development. Hanifah Mahat in 2017 discovered that an atrocious negligence towards the sustainability education in the Malaysian school's classroom. It could be related to what Reza (2016) discovered which was teacher-centred pedagogical strategies does not seem to be effective in order to incorporate sustainability knowledge. Furthermore, Chinedu & Mohamed (2017) reported that practices of environmental behaviour among teachers were not in concert with the level of environmental concern and knowledge. Additionally, pre-service teachers do not have strong environmental knowledge and self-efficacy beliefs related to environmental education (Keles 2017 & Sadik& Sadik 2014). In fact, in 2018, Kukkonen, Kärkkäinen, & Keinonen also discovered that teacher education students had very weak ecological knowledge although they were the occasional doers in their everyday activities.

The National Report of Malaysia on Development of Education (Ministry of Education, 2004) ESD, in particular, stated that the concepts and components of environmental sustainability education is being implemented across the curriculum at all levels of schooling (Hanifah, Shaharudin, Mohmadisa, Nasir, & Yazid, 2015). The Ministry has used the infusion and integration approach, whereby sustainability issues were infused and integrated into subjects at the school level (Hanifah et al., 2015). The teaching of sustainability education is closely related to the nation's aim of developing a society that is sensitive and possesses appropriate knowledge, skills and values towards environmental issues and able to contribute to the solutions of the sustainability education problems (Rubab, Aziz, Usman, & Amjad, 2020) . However, the attitude and action of Malaysian students towards environmental problems indicated that students were not very enthusiastic in solving environmental problems (Wee, Ariffin, Ng, and Shabudin, 2017) . The environmental education is not translated into habits and lifestyles of the students, which is essential especially in changing the mind-set of the citizens, as well as in inculcating the younger generation's sustainable lifestyles (Im, King, & Othman, 2014)

The Malaysian teaching system has been blamed for abysmal negligence towards the sustainability education in the classroom (Hanifah Mahat, 2017). Unfortunately, a very limited number of teachers know how to actively combine their instructional strategies or learning activities through practice and change. Insufficient knowledge of sustainable behaviour among teachers is a barrier to the integration of sustainability practices into the classroom. A number of research reports indicate that teacher-centred pedagogical strategies seem not to be effective for learners to successfully relate and incorporate

sustainability knowledge (Reza, 2016). Teachers do not internalize the topics related to the environment to such an extent which is enough to become a member of an environmental community, participate in seminars/conferences related to environmental issues, or follow such issues on their own volition through media. This may result from the theoretical teaching of sustainable education, rather than applied.

There is widespread opinion that teachers' conceptions of pedagogy play a crucial role in their effectiveness as primary mediators between the subject and the learner (Kyridis, Mavriki & Tsakridou, 2005). This was further highlighted by Finger (1994) in her study explaining the relationship between environmental sustainability knowledge and action. Finger (1994) suggested that the major challenge for educators stems from the fact that individuals are already highly aware and concerned when it comes to environmental issues and problems, yet do not display the corresponding environmental behaviour. Finger (1994) also asserted that the fall in developing appropriate behaviours is due to the ineffective teaching strategies used to deliver the environmental education.

Teachers lack the knowledge, requisite skills and action regarding the teaching of environmental education. Keles (2017) reported that the participating pre-service teachers do not have strong environmental knowledge and self-efficacy beliefs related to environmental education. It was discovered that their knowledge on issues like nuclear waste and air pollution is especially weak (Sadik & Sadik, 2014). However, their understanding of environmental issues and recognition of environmental problems was only at the surface level. The findings also indicated that awareness and sensitivity towards environmental issues were very low. Furthermore Chinedu & Mohamed (2017) reported that although Malaysian in-service teachers possessed a considerable level of environmental knowledge, they lacked a general understanding of the underlying causes of environmental sustainability problems. They also reported that the practices of environmental behaviour among teachers were not in concert with the level of environmental concern and knowledge. This is probably due to the fact that the framework for implementation of sustainable education is uncoordinated and not structured towards effectiveness within the National Education System (Nair, Mohamed, & Marimuthu, 2013). Therefore, this can definitely present some challenges especially to the future educators in terms of advancing the development of ecological knowledge as well as global issues.

There is a dire need for the development of teachers' understandings of sustainability so that teachers can plan and teach sustainability education programs effectively to future generations. Chinedu and Mohamed (2017) reported that there are still quite a number of teachers who never participated on any professional development on Environment Education. There is lack of standardized structure, uniformity, and framework regarding the sustainability education throughout the teacher training institutions. Moreover, there is over-emphasis on passing the exam rather than focus on the practical teaching skills, knowledge, and competencies in the teacher training institutions in Malaysia.

The relationships between the attitudes, subjective norms, perceived availability of facilities, knowledge and behavioural intention has not yet been clarified in the

Malaysian context, so it is not obvious which one is more dominant towards the environmentally sustainable behaviour. Therefore, the goal of the present study is to investigate the relationships between the attitudes, subjective norms, perceived availability of facilities, knowledge and behavioural intention of Malaysian pre-service teachers as catalysts to their participation in sustainable behaviour program such as the Sustainable ITE. Finding the relationships between these variables also facilitates the creation of learning approaches for different studies that teach sustainability in Malaysia at all levels of education. Additionally, in a study on green purchasing by Joshi and Rahman (2015) authors revealed that limited availability and difficulties in accessing facilities like green products were a substantial barriers for the consumer to buy environmentally sustainable products (Padel & Foster, 2005; Young, Hwang, McDonald, & J. Oates, 2010). The lack of facilities has always been a hindrance towards encouraging environmental and sustainable behaviour. Moreover, Khalil (2018) suggested that facilitating condition provides a significant effect on recycling behaviour among households and thus making them convenient and accessible to people which inevitably encourages recycling behaviour (Khalil, 2018) which is part of a sustainable behaviour.

In sum, there is a lack of works that have employed empirically validated theories to examine the key factors influencing environmentally sustainable behaviour among pre-service teachers. Therefore, this research is narrowing several the gaps in this area. Thus, a predictive model should be developed to enhance the understanding of environmentally sustainable behaviour particularly amongst pre-service teachers in Malaysia. This study shall benefit relevant organisations in regard to creating effective guidelines and behavioural interventions in terms of governing appropriate mitigation measures. Thus, more insights into socio-psychological factors influencing the behavioural modification providing an in-depth description of how to achieve a sustainable society and consequently enhance the quality of sustainability education in this country.

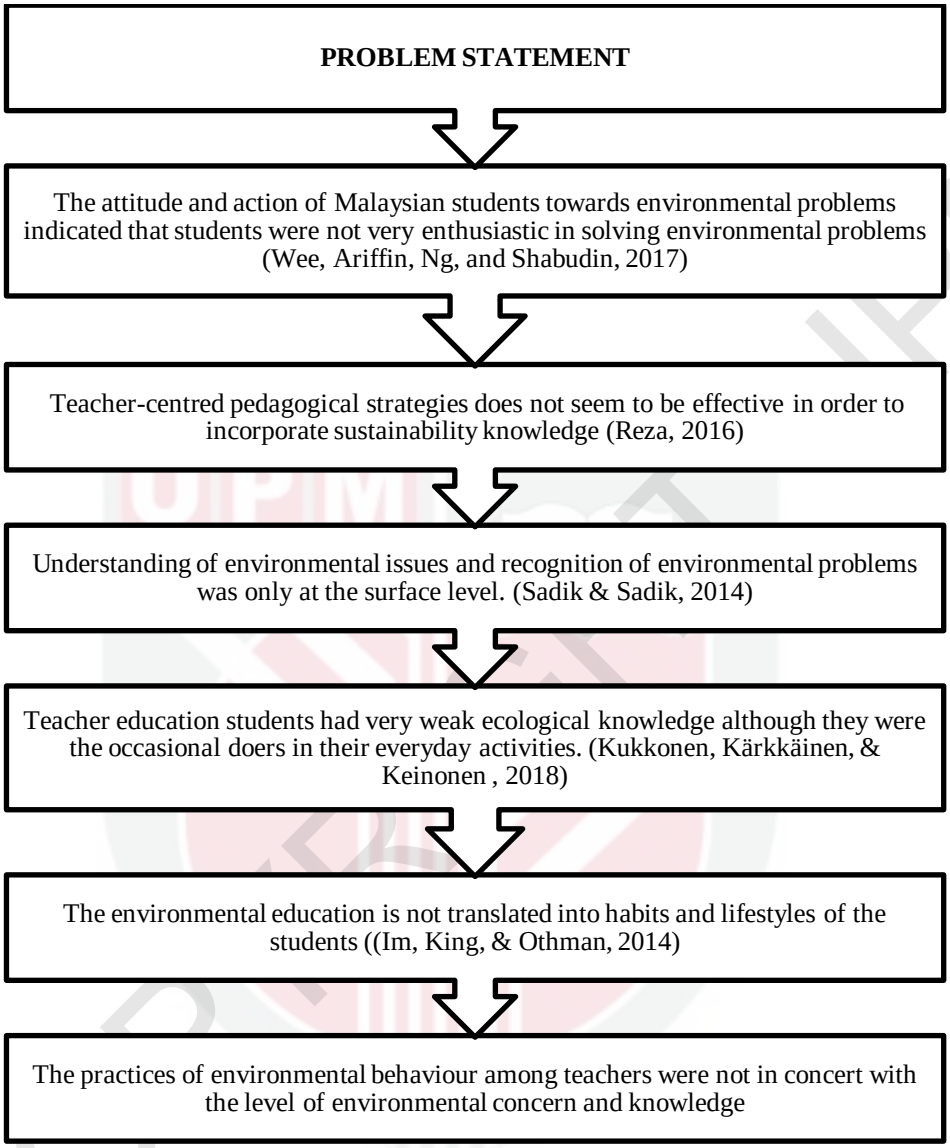

Figure 1.1: Funnel transition from the general context to Environemnt Education issues

1.5 Research Objectives

The general objective of this study is to develop a model that predicts the environmentally sustainable behaviour among pre-service teachers training in the Malaysian Institute of Teacher Education. The specific objectives of this study are as follows:

1. To describe sustainability action skills, knowledge of sustainability strategies, knowledge of sustainability issues, environmentally sustainable attitude, perceived availability of facilities, subjective norms, environmentally sustainable behavioural intention and environmentally sustainable behaviour among pre-service teachers in Malaysia.

2. To determine the direct effect of behavioural intention and environmentally sustainable behaviour among pre-service teachers in Malaysia.

3. To determine the direct effect between sustainability action skills, knowledge of sustainability strategies, knowledge of sustainability issues, environmentally sustainable attitude, perceived availability of facilities, subjective norms towards and environmentally sustainable behavioural intention environmentally sustainable behaviour among pre-service teachers in Malaysia.

4. To examine the role of field of study on the relationship between predictors and environmentally sustainable behaviour and the role of Environment Education course on the relationship between predictors and environmentally sustainable behaviour.

5. To develop a prediction model to predict factors that influence environmentally sustainable behaviour among pre-service teachers in Malaysia.

1.6 Research questions

Based on the first objective, the study addressed the following research questions:

1. What are the pre-service teachers' perception towards sustainability action skills, knowledge of sustainability strategies, knowledge of sustainability issues, environmentally sustainable attitude, perceived availability of facilities, subjective norms, environmentally sustainable behavioural intention and environmentally sustainable behaviour?

2. What is the direct effect of behavioural intention and environmentally sustainable behaviour among pre-service teachers in Malaysia?

3. What are the direct effects between sustainability action skills, knowledge of sustainability strategies, knowledge of sustainability issues, environmentally sustainable attitude, perceived availability of facilities, subjective norms towards and environmentally sustainable behavioural intention

environmentally sustainable behaviour among pre-service teachers in Malaysia?

4. What are the moderating effects of field of study and Environment Education course on the relationship between key predictors and environmentally sustainable behaviour?

1.7 Limitation of study

The scope of this study is limited to the pre-service teachers studying in the Malaysian Institutes of Teacher Education. Although there are other Higher Education Institutions (HEI) that trains future teachers. For example, the faculty of education from any public universities also trains future teachers; this study is focusing on the participants who are selected from Institutes of Teacher Education from each zone in Malaysia. The reason for this selection is discussed in subsection 2.11.
There are 27 Institutes of Teacher Education in Malaysia which are divided into five zones. The zones are Central Zone, Southern Zone, Northern Zone and East Coast Zone in peninsular Malaysia including Sabah and Sarawak (East Malaysia Zone). One Institute of Teacher Education was selected from each zone from Peninsular Malaysia covering a total of five (5) Institutes of Teacher Education.

Furthermore, this study is designed only to measure the key predictors towards environmentally sustainable behaviour at a specific point in time. From this data alone we cannot conclude that an intervention (such as an education program) which increases an individual's knowledge, or attitude will correspondingly increase their participation in environmentally sustainable behaviours. This study brings us to examine the relationship between all the key predictors and environmentally sustainable behaviours and whether field of study moderates the relationship between knowledge of sustainability action skills, knowledge for sustainability strategies and knowledge for sustainability issues and environmentally sustainable behaviours. Rather, this survey alone is insufficient to draw a conclusion regarding the efficiency of the Eco-Institutes Program that was introduced by the WWF in 2012. Nevertheless, in order to further evaluate the relationship between changes in the key predictors and changes in behaviour, other types of research design should be applied. Ultimately, the survey's quantification of every key predictor is not intended to produce precise measurements but instead to extract relationships among a large population that would be impossible using the usual qualitative or case study approach.

1.8 Significance of study

This research was carried out with the view that the findings will be significant to environmentally sustainable education in Malaysia. This study is most probably the unique study of its kind to predict environmentally sustainable behaviour that contributes to the sustainability education. It will pave the way for the implementation and evaluation of the environmentally sustainable education by producing valid and reliable instruments

for this purpose. It is also suggested that these instruments can be used for future research in the educational research disciplines.

In the practical perspectives, the findings of this research will contribute some empirical overview for further investigation regarding the variables and key determinants of the structural model and gives proven data of relationships between the variables. Besides, this study will also provide proof and evidence on the positive impacts of education for sustainable development. The research outcome of this study provides constructive sources to educational administrators, planners, and relevant educational ministry for establishing national and institutional strategies for the environmental sustainability in the future.

On the other hand, this research contributes to the Sustainable Development Goals by suggesting some solutions and design strategies that can contribute to creating good lives for the community today and in the future, with the goal of addressing the global challenges of dealing with complex societal problems at the interaction between nature and society (Schäfer et al. 2010).

Furthermore, this study can be advantageous theoretically, since it contributes to the body of knowledge by the combination of two theories, namely The Theory of Planned Behaviour by Ajzen (1991) and the Model of Environmentally Responsible Behaviour (1986).

In terms of method, this study contributes a predictive model based on the factors driving environmentally sustainable behaviour between the predictors of environmentally sustainable behaviour among pre-service teachers in Malaysia – using PLS SEM as well as testing moderating effect of environment education course and field of study on the predictive model. In addition, the proposed predictive model provides a comprehensive explanation on the factors that influence pre-service teachers' sustainable behaviour. This model will encourage researcher to conduct further studies in environmental sustainability education. The model can be used in predicting factors that influence the environment behaviour among students in any institutions of higher learning. However, although the model is derived from higher learning institutions, it can be used by any organisation such as primary and secondary schools or any institutions especially in the education sector.

In the context of policy, this study can support and encourage initiatives aimed at reorienting existing educational structures and practices to address sustainable development at all levels.

1.9 Operational Definition of terms

The main definitions of terms for this study are as follows:

1.9.1 Sustainability Education

Sustainability education as referred to Sterling (2004) is a catch to include all the environmental education (EE), education for sustainable development (ESD) and education for sustainability (EfS). Beyond these terms, sustainable education is mostly used in order to suggest a shift of environmental paradigm, rather than a modification of the existing program.

1.9.2 Education for Sustainable Development (ESD)

Education for Sustainable Development refers to the learning required to maintain and improve the quality of life for future generations. Holfelder (2019) defines ESD as a way towards a better life for present and future generations. It is a dynamic process that requires each individual to identify their potential and improve the quality of life. Siraj-Blatchford, Smith, & Samuelsson (2010) sees ESD as an education mission to find the balance between human well-being and economic development alongside cultural traditions and respect for natural resources. Jagger (2020) defines ESD as a learning to understand human and environmental interactions and how the environment is being managed wisely and responsibly towards the preservation of earth.

According to UNESCO, education for sustainable development (ESD) involves the integration of key sustainable development issues into teaching and learning which may include, climate change, biodiversity, disaster risk reduction, sustainable consumption and poverty reduction. It also requires participatory teaching and learning methods which motivate and empower learners to change their behaviours as well as taking action for sustainable development.

1.9.3 Institutes of Teacher Education - *Institut Pendidikan Guru (IPG)*

The Institutes of Teacher Education are teacher training institutions for the training of primary school teachers (Mahmud, Nasri, Samsudin, & Halim, 2018). The institutes offer a total of six major programs offering a degree and diploma in the education field. Upon completing their studies in the Institutes, the student teachers are sent to the Malaysian National Schools under the Ministry of Education all over the country to begin their service as teachers. In this research, the institution for teacher education used are government owned training institutions responsible for preparing teachers for the primary education of Malaysian education system (Goh, Canrinus, & Wong, 2020).

1.9.4 Eco-Institutes in Malaysia

Ministry of Education on advocating an Environmental Education (EE) policy, WWF-Malaysia launched a program introduced Eco-Schools and Eco-Institutes programmes (WWF-Malaysia, 2012a). An MOU was signed in July 2012 between WWF and Malaysia's Ministry of Education. This program has been adopted to guide educational institutions to become environmentally sustainable or green, using the Foundation of Environmental Education's (FEE) Seven Step Methodology from the Eco-Schools programme. Specific skills building activities for trained teachers and lecturers were held. More than 300 teacher trainees as well as 100 lecturers were trained since 2014 in regard to environment and sustainability.

1.9.5 Sustainable ITE (*IPG Lestari*)

IPG-Lestari programme, which is being introduced a joint venture with Institutes of Teacher Education Malaysia, MOE (headquarters) in all the 27 Institutes of Teacher Education in Malaysia, is expected to offer a better understanding as to how teacher trainees can organise themselves to identify environmental issues and work on solutions by collaborating (plan their actions, get the whole institute involve, generating interest, work with external agencies) with broader audience within the educational institutes as well as with local communities. All Institutes of Teacher Education in Malaysia were branded as 'Sustainable ITE' starting in 2012. Sustainable ITE was introduced in conjunction to the Eco-Institute's program which is a collaborative network between Institute of Teacher Education and WWF (World Wide Fund for Nature), Universiti Pendidikan Sultan Idris (UPSI), University Sains Malaysia (USM) and Natural Resources and Environment Board Sarawak (NREB) which was signed in July 2012. The programme adopts its concept from Eco-Schools programme and it aspires to empower pre-service teachers to take action to find solutions to environmental issue in their campus area. This program is in line with the ESD implementation. Since ESD in higher education institutions can manifest itself in a variety of ways, some institutions employ a formal learning approach that includes organised and systematic content as well as a sustainable development syllabus. Other institutions on the other hand, take an informal learning approach by incorporating experiential learning. In Malaysia, the MOE has made significant efforts to introduce sustainable development issues in tertiary institutions across all disciplines, either in a subject dedicated specifically to sustainable development or in a topic of a subject that focuses on sustainable development. Thus, it can be stated that Malaysia has addressed issues of sustainable development in the social, economic, and environmental dimensions. In the Institute of Teacher Education, the ESD is implemented by a program called the IPG Lestari (Sustainable ITE) which is a co-curricular program. At the same time, there are also elective courses called the Environment Education that is offered to the pre-service teachers.

1.9.6 Pre-service teachers

The term pre-service teachers is used to all students studying in the Teacher Education Institutions undergoing training to become primary school teacher in the Malaysian Education System. Besides the term pre-service teachers, the researcher also uses the term future teachers and student teachers.

1.9.7 Environmentally sustainable behaviour

Environmentally sustainable behaviour is the set of effective and deliberate actions directed towards the conservation and /or preservation of physical and cultural resources, integrity of animal and plant species, and individual and social well-being and safety of present and future generations" (Juárez-Nájera, Rivera-Martínez, & Hafkamp, 2010). The sustainable behaviour that is measured in this study covers the three pillars of sustainability by UNESCO (2005) where their behaviour must reflect social, environment and economy aspects as well.

1.9.8 Knowledge

Knowledge is defined as the awareness, familiarity, or understanding of something, such as facts, descriptions, information or skills, which is acquired along with experience or education by discovering, perceiving, or learning. Knowledge can refer to a theoretical or practical understanding of a particular topic or a subject. Hines, Hungerford, & Tomera (1987) published their *Model of Responsible Environmental Behaviour* in 1987, and it was a modified version which was based on Ajzen and Fishbein's theory of planned behaviour (Ajzen, 2002; Hines et al., 1987; Sia, Hungerford, & Tomera, 1986). According to this model, the knowledge variables that explains an environmentally responsible behaviour of a person includes: 1. *Knowledge for action skills*: Individuals with knowledge on life skills so that they take the right action is dealing with any situation. 2. *Knowledge of issues: The i*ndividual has to be familiar with the environmental issues surrounding them as well as its causes. 2. *Knowledge of action strategies:* The individual has to know the strategies needs to be taken in order to lower the impact on the environmental issues (Hines et al., 1987; Sia et al., 1986) . For this research study, knowledge is one of the independent variables. Knowledge is referred to as the pre-service teacher's perception of how much information they know about certain skills or action in regard to sustainability. The operational definition for each construct for knowledge is elaborated as follow:

i. Sustainability action skill

Action skills for sustainability entail the ability to transform the current patterns of action by making value judgements about different ways to act. In this study Action skills treated as independent variable which is one of the factors that contribute to environmentally sustainable behaviour. It is a kind of knowledge about how pre-service

teachers perceive themselves reacting towards certain situation that they might have learnt in any phase of their life before.

ii. Knowledge for sustainability strategies

Another independent variable which is also treated as a factor that might contribute towards environmentally sustainable behaviour. This variable is about how the pre-service teachers perceive themselves as someone who knows what are the strategies that should be taken in order to keep the resources in the world sustainable. This variable is also about how the individual perceive themselves as someone who know the strategic actions that needs to be taken in order to lower the impact on the environmental issues.

iii. Knowledge for sustainability issues

Another factor that might contribute to environmentally sustainable behaviour based on the Model of Responsible Environmental Behaviour. For this particular study, a person who would behave in an environmentally sustainable behaviour must know the issues on sustainability as well as any issues in sustaining the resources on the earth. The common sustainability issues that have always been discussed are for example climate change, energy resources, biodiversity, inequality, water scarcity, food production and many more, are quite large and complex which involves governments, global citizens, institutions and NGOs. Thus, having knowledge on the issues can give them more awareness and contribute individuals to behave in a more environmentally sustainable behaviour.

1.9.9 Environmentally Sustainable Attitude

Attitude refers to an enduring combination of motivational, emotional, perceptual and cognitive processes with respect to some aspect of our environment (Eilam & Trop, 2012; Krech & Crutchfield, 1948a). Environmental attitudes are perceived commonly as preconditions for achieving environmental behaviour (Keles, 2017). Under this construct, the researcher wants to find out the pre-service teachers' attitude towards performing environmentally sustainable behaviour. In this study, the variable attitude refers to the psychological emotion of the whole evaluation of performing sustainable behaviour of the preservice teachers.

1.9.10 Subjective norms

Subjective norms refer to the belief that an important group of people or person will support and approve a particular behaviour. Subjective norms are determined by the perceived social pressure from others for an individual to behave in a certain way and their motivation to adhere with those people's views (Hines et al., 1987). Here the researcher wants to find out the extent of influence of people surrounding like family, teachers or friends in terms of environmental sustainable behaviour. This variable refers

to one's perception of the social pressure as well as expectation from significant people around them as to perform a sustainable behaviour.

1.9.11 Perceived availability of facilities

Perceived availabilities of facilities is the individual's perception on the availability of facilities to assist them in engaging in environmentally sustainable behaviour (Khalil et. al, 2018). This study is referring this variable in which it extends the perception of availability and accessibility of certain facilities or amenities that can assist them in performing sustainable behaviour. For instance, in order to separate waste, there must be a separate bin provided as one of the facilities in the pre-service teachers' residency.

1.9.12 Environmentally Sustainable Behavioural Intentions

Environmental Sustainability Behavioural Intention defined as the willingness to perform certain action (Fishbein & Ajzen, 1975). Intentions are self-instructions to perform particular behaviours or to obtain certain outcomes (Triandis, 1980) and are usually measured by endorsement of items such as "I intend to do …" Forming a behavioural or goal intention signals the end of the deliberation about what one will do and indicates how hard one is prepared to try, or how much effort one will exert, in order to achieve desired outcomes (Ajzen, 2002; Sheeran, Milne, Webb, & Gollwitzer, 2005). Intentions thus are assumed to capture the motivational factors that influence a behaviour (Ajzen, 1991). Theories of attitude–behaviour relations, models of sustainable environmental behaviour, and goal theories all converge on the idea that intention is the key determinant of behaviour (summaries by Abraham, Sheeran, & Johnston, 1998; Eagly, A.H., Chaiken, 1993; Gollwitzer & Moskowitz, 1996; Maddux, 1995; Norman & Conner, 1996; Vancouver & Austin, 1996).

1.9.13 Field of study

ITE uses the term 'Option' to indicate the course major which the pre-service teachers are majoring in. If a pre-service teacher majors in science, that would mean he/she will have the probability of becoming a science teacher once he/she embarks on his/her career as a teacher. This study is looking at how the different fields can affect the strength of the relationship between predictors and the dependant variable. During this particular study, there are 11 subject options that were discovered which are Malay language, Teaching English as a Second Language, Islamic Studies, Science, Mathematics, History, Music, Chinese language, Tamil language, Counselling, and Early Childhood Education. Field of Study for this particular research is looking at three important fields which are Science (Mathematics and Science major), Language (Malay Language, TESL, Chinese Language and Tamil Language) and Social Studies (Islamic Studies, Counselling, History, Early Childhood Education and Music). By the end of this research, the difference field of study of the pre-service teachers is tested as the moderator to see if there are significance in the ESB Model for pre-service teachers.

1.9.14 Environment Education

Environmental Education is a lifelong, holistic learning process directed at creating responsible individuals who identify and explore environmental issues, participate in problem solving, and take solid action to develop a sustainable environment. For the purpose of this research Environment Education is a course that can be taken by the pre-service teachers, optionally. Although it is not a mandatory course, pre-service teachers are encouraged to enrol as to enhance their knowledge and practice in environment and sustainability.

1.10 Chapter Summary

This chapter presented an introduction to this thesis, which included the research background and an overview of the particular context in which this research took place. A broad focus was to determine the factors that influence Environmentally Sustainable behaviour among pre-service teachers, followed by a focus on the pre-service teacher's about environmentally sustainability. As background, this context would enable better engagement with the nuances of this study and its emphasis on pre-service teacher's knowledge about the sustainability within the broader context of Malaysia. Other compilations included sections on the significance of the study, its aims and scopes, research questions, research methods, and a glossary of terms. The next chapter provides a comprehensive literature review on the areas of research relevant to the context of this study.

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