SUSTAINABILITY CONSCIOUSNESS IN NEW GENERATIONS

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ABSTRACT

SUSTAINABILITY CONSCIOUSNESS IN NEW GENERATIONS

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The aim of this study is to investigate the sustainability consciousness levels of ninth-grade students in Turkey and how well students' sustainable behavior levels can be predicted by using their sustainable knowingness and sustainable attitude levels. The study employed associational research methodologies, including correlational and causal-comparative research. Data for the main study was collected from 922 ninth-grade students currently enrolled in five different public Anatolian high schools and two public science high schools located in the Şehitkamil district of Gaziantep, selected through the convenience sampling method. All data were collected in the spring semester of the 2023-2024 academic year. The ninth-grade students' sustainability consciousness were obtained through *Sustainability Consciousness Questionnaire* adapted into Turkish by Yüksel and Yıldız (2019). Descriptive statistics showed high-level sustainability consciousness for these students. Moreover, the findings revealed a significant gender difference in sustainability consciousness levels, with male students exhibiting a higher-level sustainability consciousness than females. In order to examine the significant predictors of sustainable behaviors path analysis was conducted. Results showed that sustainable

attitude can directly predict ninth grade students' sustainable behavior, whereas sustainable knowingness indirectly.

Keywords: Sustainable Development, Education for Sustainable Development, Sustainability Consciousness, Sustainable Behavior

ÖZ

YENİ NESİLLERDE SÜRDÜRÜLEBİLİRLİK BİLİNCİ

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Bu çalışmanın amacı, Türkiye'deki dokuzuncu sınıf öğrencilerinin sürdürülebilirlik bilinci seviyelerini incelemek ve öğrencilerin sürdürülebilir davranış seviyesinin sürdürülebilirlik bilgisi, sürdürülebilirlik tutumu seviyesi kullanılarak ne kadar iyi yordayabileceğini incelemektir. Çalışma, ilişkisel araştırma yöntemlerini, korelasyonel ve nedensel karşılaştırmalı araştırmaları içermektedir. Ana çalışma için veriler, uygun örnekleme yöntemiyle seçilen Gaziantep'in Şehitkamil ilçesinde bulunan beş farklı devlet Anadolu lisesi ve iki devlet fen lisesinde kayıtlı olan 922 dokuzuncu sınıf öğrencisinden toplanmıştır. Tüm veriler, 2023-2024 eğitim-öğretim yılının ikinci döneminde toplanmıştır. Dokuzuncu sınıf öğrencilerinin sürdürülebilirlik bilinci Yüksel ve Yıldız (2019) tarafından Türkçeye uyarlanan Sürdürülebilirlik Bilinci Anketi ile elde edilmiştir. Tanımlayıcı istatistikler, dokuzuncu sınıf öğrencilerinin yüksek düzeyde sürdürülebilirlik bilinci sergilediğini göstermektedir. Ayrıca, bulgular, erkek öğrencilerin kadın öğrencilere kıyasla daha yüksek düzeyde sürdürülebilirlik bilinci sergilediğini ortaya koymaktadır. Sürdürülebilir davranışın önemli yordayıcılarını incelemek amacıyla yol analizi yapılmıştır. Sonuçlar, sürdürülebilir tutumun doğrudan dokuzuncu sınıf

öğrencilerinin sürdürülebilir davranışlarını yordadığını, sürdürülebilir bilginin ise dolaylı olarak etkilediğini göstermektedir.

Anahtar Kelimeler: Sürdürülebilir Kalkınma, Sürdürülebilirlik İçin Eğitim, Sürdürülebilirlik Bilinci, Sürdürülebilir Davranış

To My Family

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ABBREVIATIONS

Aeco: Economic Attitude

Asoc: Social Attitude

Aenv: Environmental Attitude

Beco: Economic Behavior

Bsoc: Social Behavior

Benv: Environmental Behavior

df: Degree of Freedom

EFA: Explanatory Factor Analysis

ESD: Education for Sustainable Development

H_0: Null Hypothesis

Keco: Economic Knowingness

Kenv: Environment Knowingness

Ksoc: Social Knowingness

N: Sample Size

p: Significance Level

SA: Sustainable Attitude

SB: Sustainable Behavior

SC: Sustainability Consciousness

SCQ: Sustainability Consciousness Questionnaire

SK: Sustainable Knowingness

SD: Standard Deviation

VIF: Variation Inflation Factor

β: Beta Coefficient

CHAPTER 1

INTRODUCTION

Human beings have been facing many global environmental problems such as climate change, global warming, ozone depletion, biodiversity loss and water scarcity. These global problems are too complex and wide-ranging for short-term solutions (United Nations, 2015). These global challenges' complexity and far-reaching nature require sustainable, long-term solutions rather than temporary fixes (United Nations, 1972). Due to the fact that these problems are called as complex and requires global efforts, Governments, the private sector, civil society organizations, and various segments of society must collaborate to address these problems (United Nations, 1972). Therefore, the term "sustainable development" has emerged (WCED, 1987).

Sustainable development defined in Brundtland report as

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987, p. 43).

Following the publication of the Brundtland Report, sustainable development has emerged as a central concept in international discussions and policy frameworks, notably at the United Nations Conference on Environment and Development (UNCED) in 1992. In 1992, "Agenda 21" was adopted at the UN Conference on Environment and Development. It is a global action plan for sustainable development, promoting cooperation among governments, the private sector, and civil society to address environmental and development challenges (UNCED,

1992).. In 2000, the United Nations established the Millennium Development Goals (MDGs) to be achieved by 2015 (United Nations, 2000). The eight goals are:

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria, and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development (United Nations, 2000).

The outcomes of these goals were evaluated in The Millennium Development Goals Report 2015 (United Nations, 2015). This report highlights that although significant global improvements were made, critical goals—particularly in poverty, gender inequality, health, and environmental sustainability—were not met by 2015 (United Nations, 2015). In 2002, the World Summit on Sustainable Development (WSSD) was held in Johannesburg, two years after the publication of the Millennium Development Goals (MDGs) (United Nations, 2002). A key outcome of the summit was the Johannesburg Plan of Implementation (JPOI), also known as Agenda 21+ (United Nations, 2002). This framework was adopted to enhance sustainable development and emphasized the importance of fulfilling the commitments outlined in Agenda 21. The Rio+20 conference, officially known as the United Nations Conference on Sustainable Development, took place in Rio de Janeiro, Brazil, in 2012. The conference produced a document titled "The Future We Want," which outlines specific and practical steps for implementing sustainable development (United Nations, 2012). The 2030 Agenda for Sustainable Development, adopted by the United Nations General Assembly on September 25, 2015, is a transformative roadmap aimed at eradicating poverty, protecting the planet, and promoting prosperity for all by 2030 (United Nations, 2015). Central to this agenda are the Sustainable Development Goals (SDGs), which encompass 17 goals and 169 targets

designed and accepted by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development (United Nations, 2015).

The SDGs provide a comprehensive framework to address various dimensions of sustainable development, including social, economic, and environmental aspects. These three aspects are commonly referred to as the three pillars of sustainable development in the literature (e.g., UNESCO, 2005). A detailed description of three pillars of sustainable development by UNESCO:

> Society: an understanding of social institutions and their role in change and development, as well as the democratic and participatory systems which give the opportunity for the expression of opinion, the selection of governments, the forging of consensus and the resolution of differences.
>
> Environment: an awareness of the resources and fragility of the physical environment and the effects on it of human activity and decisions, with a commitment to factoring environmental concerns into social and economic policy development.
>
> Economy: a sensitivity to the limits and potential of economic growth and their impact on society and on the environment, with a commitment to assess personal and societal levels of consumption out of concern for the environment and for social justice (UNESCO, 2005, p. 5).

These three dimensions includes fifteen perspectives/subthemes. The societal dimension encompasses the following perspectives: human rights, peace and human security, gender equality, cultural diversity and intercultural understanding, health and HIV/AIDS, and governance (UNESCO, 2006). The environmental dimension includes considerations of natural resources (such as water, energy, agriculture, and biodiversity), climate change, rural development, sustainable urbanization, and disaster prevention and mitigation (UNESCO, 2006). The economic dimension focuses on poverty reduction, corporate responsibility and accountability, and the market economy (UNESCO, 2006).

United Nations (1992) emphasised that to foster sustainable development, education is a key strategy. By integrating education for sustainable development into education systems, societies can raise individuals who are environmentally conscious, socially responsible, and equipped with the skills and knowledge needed to address the complex challenges of the 21st century (UNESCO, 2017).

According to UNESCO (2017), ESD encompasses various topics, including environmental conservation, social justice, poverty alleviation, climate change, biodiversity, sustainable agriculture, renewable energy, responsible consumption, and global citizenship. Moreover, aim of ESD is to integrate these themes into the educational curriculum and create learning experiences that include raising awareness, fostering skills and competencies, promoting active citizenship (UNESCO, 2017).

Raising awareness is essential for ESD (UNESCO, 2017). Sustainability Consciousness (SC) defined by Gericke et al as "experience or awareness of sustainability phenomena" (2019, p.37). It differs than environmental awareness since it also includes social and economic dimension of sustainable development. Therefore, it is important to raise individuals which have sustainability consciousness to promote sustainable development. Berglund et al. (2014) states that Sustainability Consciousness (SC) aims to integrate cognitive and affective domains which are knowledge, attitude, behavior and covers all three dimensions of sustainable development which are social, environmental and economic. However, Gericke et al (2019) prefer to use the term knowingness instead of knowledge. Since "knowledge" is the understanding of facts and information, "knowingness" involves a deeper level of comprehension, critical thinking, and practical application of knowledge, thus "knowingness has both a cognitive, knowledge-based component and an affective-based component" (Gericke et al., 2019, p. 38). Sustainable knowingness defined as ''the knowingness about the fundamentals on which SD is based on'' (Olsson, Gericke, & Chang Rundgren, 2015, p.184). Olsson et al. (2015) states that '' an attitude in the field of sustainability relates to a positive or negative feeling towards an SD issue linked to the 15 sub-themes of the SD dimensions

defined by UNESCO'' (p.184). Therefore, Sustainable attitude defined as ''the attitudes towards the SD issues'' (Gericke et al., 2019, p. 39). Sustainable behavior defined as "what people do in relation to the SD issues under consideration'' (Gericke et al., 2019, p. 39). Olsson (2018) state that "by relating the concept of SC to the UNESCO framework, the concept is also automatically related to the more recent 17 sustainable development goals (SDGs)'' (p.72). Moreover, it is emphasised that due to goal four which ESD is recognized globally as a means of providing quality education, the concept of SC is expected to be enduring, directly linked to the current and future sustainability goals of Agenda 2030 (Olsson, 2018). Moreover, Gericke et al. (2019) revised a scale "Sustainability Consciousness Questionnaire (SCQ)'' which is developed by Michalos et al. (2012) to assess knowledge, attitude, and behavior based on UNESCO subthemes. Since it is argued that, previous studies focused on just environmental dimension (e.g. Sánchez & Lafuente, 2010), or three dimensions of SD with just on cognitive or affective domain.

However, there are many psychometric variables which SC does not include such as values, interests, motivations (Olsson, 2018). Furthermore, it is stated that SC do not claim a direct relationship between sustainable knowingness and sustainability behavior (Olsson, 2018). To establish the relationship between the sustainable knowingness, sustainable attitude and sustainable behavior, there are lots of theory and model in the literature. There are many variables and models which shape sustainable behavior in the context of environmental education and education for sustainable development. Although these models mostly have been using to explain determinants of environmental behavior, it is also used to explain the determinants of sustainable behavior. The models mostly used to explain sustainable behavior are Knowledge, Attitude, Behavior (KAB) Model, Models of predictors of environmental behavior by Hines, Hungerford and Tomera (1987), The Value-Belief-Norm (VBN) theory, The Theory of Reasoned Action (TRA) and Theory of planned behaviour (TPB). The Knowledge, Attitude, Behavior (KAB) Model also known as "Early Linear Model" states that knowledge influence attitude that leads to behavior change (Hungerford & Volk, 1990). In this model, an increase in

knowledge about a specific topic can lead to changes in attitudes, which can subsequently influence behavior (Hungerford & Volk, 1990). In the context of environmental education this model states that increased environmental knowledge leads to environmental attitude, which encourages pro-environmental behavior. Although it is argued that this model may be insufficient to explain the relationship between knowledge attitude and behavior since increase in environmental knowledge may not always lead positive attitude which turns environmental behavior, or attitudes may not cause acting in environmental behavior (Kollmus & Agyeman, 2002). To overcome these reasons many other models developed by researchers. One of those models is Models of predictors of environmental behavior by Hines, Hungerford and Tomera (1987). According to the model, factors explain environmental behavior are knowledge of issues, knowledge of action strategies, locus of control, attitudes, verbal commitment, and an individual's sense of responsibility (Hines et al., 1987). The model asserts that knowledge, skills, and personality traits such as attitudes and locus of control clearly drive the desire to act. Furthermore, situational factors, including economic constraints and social pressures, significantly influence this behavior, either inhibiting or reinforcing it. Another model is The Value-Belief-Norm (VBN) theory which is developed by Stern et al. (1999) to determine the factors which explain environmental behavior. According to the Value-Belief-Norm (VBN) theory, individuals' altruistic values (concern for the welfare of others), biospheric values (concern for the environment and ecosystems), and egoistic values (concern for personal costs and benefits) shape their environmental beliefs which enhance awareness of consequences (AC) and ascription of responsibility (AR), which activate personal norms (feelings of moral obligation), ultimately leading to pro-environmental behaviors (Stern, 2000). Another model is The Theory of Reasoned Action (TRA) which is developed by Ajzen and Fishbein (1980). TRA propose that a person's behavior is mainly influenced by their intention to engage in that behavior, which is affected by two main factors: attitudes towards the behavior and subjective norms (Ajzen & Fishbein, 1980). Moreover, Ajzen (1985) noted that intention is not always the primary factor

influencing behavior, especially when those behaviors are not volitional control. Therefore Ajzen(1985) proposed the new model which is The Theory of Planned Behavior (TPB) by adding new variable which is perceived behavioral control to TRA. According to the TPB, there are three predictors of behavioral intention which are attitudes toward the behavior, Subjective norms and perceived behavioral control.

Although it is argued that KAB model may be insufficient to explain the relationship between knowledge attitude and behavior, it is still mostly used in many areas. Lučić and Uzelac (2024) stated that KAB model "could serve as a suitable framework for investigating sustainable behaviour among young adults as desirable behaviour" (p.3). Moreover. Some studies examined the direct relationship between Sustainable knowledge, sustainable knowingness and sustainable behavior. Leal et al. (2024) explored sustainability perceptions among higher education students, focusing on the relationship between their knowledge, attitudes, and behaviors regarding sustainability by using KAB model. They used Sustainability consciousness questionnaire. Leal et al. (2024) found that sustainable knowingness positively predicted sustainable attitude directly, sustainable attitude predicted sustainable behavior directly, sustainable knowingness predicted sustainable behavior directly, sustainable knowingness predicted sustainable behavior indirectly via sustainable attitude. According to Domínguez-Valerio et al. (2019) conducted a study to detect high school students' sustainable knowingness, sustainable attitude and sustainable behavior by adapting SCQ and in the Dominican Republican and they found that there was a significant direct effect sustainable knowingness on sustainable attitude and sustainable attitude on sustainable behavior directly, however, there was no significant direct effect of sustainable knowingness on sustainable behavior. Moreover, sustainable knowingness significantly predicts sustainable behaviour through sustainable attitude indirectly.

Thus, this study examines the level of sustainability consciousness and its components which are sustainable knowingness, sustainable attitude and sustainable behavior. Moreover, KAB model was used as a theoretical framework to relationship

between sustainable knowingness, sustainable attitude and sustainable behavior. Based on the KAB model following null hypothesis were constructed and hypothesised model illustrated fig 1.2 below:

H_0_1: There is no significant effect of Sustainable Knowingness on Sustainable Behavior.

H_0_2: There is no significant effect of Sustainable Knowingness on Sustainable Attitude.

H_0_3: There is no significant effect of Sustainable Attitude on Sustainable Behavior

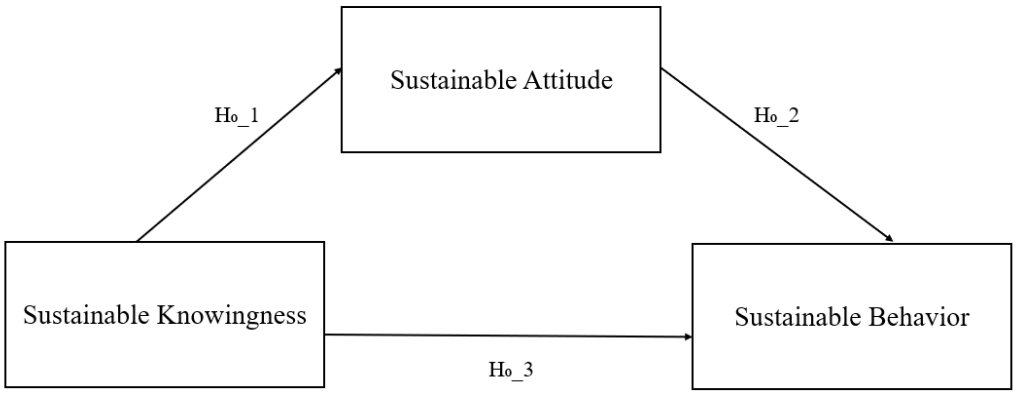

Figure 1.1 Hypothesised Model for Current Study

Additionally, many studies revealed gender difference sustainability consciousness and its subdimensions. Olsson and Gericke (2017) conducted a study in Sweden to investigate gender differences in students' Sustainability Consciousness (SC) across three dimensions: environmental, social, and economic with high school students. The results consistently showed that girls outperformed boys in all dimensions of SC. Moreover, Berglund and Gericke (2016) conducted a study investigating the

views of Swedish upper secondary students on sustainable development (SD). This study, involving 638 students aged 18–19, observed gender differences that were statistically significant across all dimensions of SC favoring girls. Another study was conducted among 489 participants, in Turkey with a diverse sample, representing individuals with various demographic backgrounds, including differences in gender, age, occupation, income levels, and prior exposure to the concept of sustainable development (Yakışık & Mustafazade, 2023). Study revealed that sustainability consciousness significantly differed between male and female participants. Specifically, male participants showed higher levels of sustainability consciousness, compared to female participants, this study revealed just overall sustainability consciousness, it did not examine its subdimensions. Moreover, Marcos-Merino et al. (2020) assessed sustainability knowingness, attitudes, and behaviors across three dimensions: environmental, social, and economic. The study also revealed gender differences in sustainability behaviors, particularly in the economic dimension. Male pre-service teachers reported higher economic behaviors. However, there were no significant gender differences in sustainability attitudes or knowingness, as both male and female pre-service teachers demonstrated similar levels of knowledge and attitudes across the sustainability dimensions (Marcos-Merino et al., 2020). Therefore, in this study SC and its subdimensions will be examined in terms of gender.

Additionally, ninth grade students were selected as a participant for the current research due to many reasons. Firstly, ESD should be implemented at all levels of education as stated in Decade of Education for Sustainable Development (DESD) documents (United Nations, 2005). Ninth graders in Turkey, newly graduated from middle schools, and detecting their SC could be important to review curricula and educational programs in terms of ESD. Secondly, Olsson and Gericke (2016) states that ninth grade students are adolescents (14–16 years old) exhibit a dip in SC. Since in this age interval, adolescents show less interest in natural environments compared to both younger and older individuals (Kaplan & Kaplan, 2002). Olsson and Gericke (2016) called this age interval as “adolescent dip’’. Therefore, it is important to

demonstrate ninth grade students SC and its subdimensions to arrange educational programs and policies.

1.1 Purpose of the Study

The aim of this study is to examine sustainability consciousness levels of ninth-grade students in Turkey and how well students' sustainable behavior levels can be predicted using sustainable knowingness and sustainable attitude levels.

1.2 Research Questions

Three research questions guide this study:

1) What are the Sustainability Consciousness levels of high school students?

2) Is there a statistically significant difference in Sustainability Consciousness level with respect to gender (male, female)?

3) What is the relationship between sustainable behaviour, sustainable knowingness and sustainable attitude?

    a) To what extent can students' sustainable behaviour level be predicted by sustainable knowingness and sustainable attitude level?
    b) To what extent can students' sustainable attitude level be predicted by sustainable knowingness level?

1.3 Significance of the Study

UNESCO (2017) emphasised that integrating education for sustainable development into education systems, societies can raise individuals who are environmentally conscious, socially responsible, and equipped with the skills and knowledge needed to address the complex challenges of the 21st century. Therefore, it is important to examine variables to tackle with 21st century challenges such as climate change. As UNESCO (2017) emphasised these variables are environmental consciousness, skills, knowledge and attitude. However, sustainability consciousness is a broader term than environmental consciousness because it includes three pillars of sustainable development which are environment, social and economic. Moreover, according to Gericke et al. (2019) sustainability consciousness has three dimension which are sustainable knowingness, sustainable attitude, and sustainable behavior. Although sustainability consciousness is a broader term, many study conducted with just environment dimension such as environmental awareness, environmental behavior or environmental attitude. However, this study conducted with taking into consideration the three dimension of sustainability consciousness which are sustainable knowingness, sustainable attitude, and sustainable behavior.

There are many studies examining the variables shaping pro-environmental behavior, however few studies examined the variables shaping sustainable behavior. Although, there are many models which explain the determinants of pro-environmental behavior, few studies conducted to predict sustainable behavior. Moreover, Boeve-de Pauw, Gericke, Olsson, and Berglund (2015) cited ‘’sustainable development can only be achieved through behavioral change’’ **(**Schultz, 2011, p.1080). Therefore, it is important to examine the variables which shape the sustainable behavior.

Gender equality is also one of the SDGs (goal 5). Moreover, goal four which is quality education highlights "By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in

vulnerable situations." (United Nations, 2015, pp. 19-20). Gender equality enhances the effectiveness of education and behavior change strategies, contributing to SD. Therefore, it is important to examine SC and associated variables in terms of gender.

Moreover, UNESCO (2005) emphasised “the need for more research, innovation, monitoring and evaluation to develop and prove the effectiveness of ESD good practices” (p.10). Determining sustainability consciousness of students and examining the relationship between associated variables are important for transforming educational programs, developing solutions to global issues, identifying steps to enhance the social impact of young people. This may help align educational goals with the aim of creating a more sustainable future.

1.4 Definition of Important Terms

Sustainable Development: a widely accepted definition of sustainable development is: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987, p. 43).

Education for Sustainability Development: According to UNESCO (2014), Education for Sustainable Development (ESD) is defined as “education that allows every human being to acquire the knowledge, skills, attitudes, and values necessary to shape a sustainable future” (p. 12).

Sustainability Consciousness: Sustainability Consciousness (SC) defined by Gericke et al as “experience or awareness of sustainability phenomena” (2019, p. 37).

Sustainable Knowingness: Sustainable knowingness defined as ‘’the knowingness about the fundamentals on which SD is based on’’(Olsson, Gericke, & Chang Rundgren, 2015, p.184)

Sustainable Attitude: Sustainable attitude defined as ‘’the attitudes towards the SD issues’’ (Gericke et al., 2019, p. 39).

Sustainable behavior: Sustainable behavior defined as ‘’ what people do in relation to the SD issues under consideration’’ (Gericke et al., 2019, p. 39).

CHAPTER 2

LITERATURE REVIEW

Literature review part of present study includes Sustainable Development, Education For Sustainable Development, Sustainability Consciousness, Models Explaining Sustainable Behavior, and Studies Related to Sustainability Consciousness: Associated Variables and Gender Difference.

2.1 Sustainable Development

The concept of sustainable development was first formally discussed and defined in the report titled “Our Common Future” also known as the Brundtland Report. The report was published by the World Commission on Environment and Development (WCED, 1987). Brundtland report stated that social, economic, and environmental issues are interconnected to each other. Also, it provided a widely accepted definition of sustainable development which is:

> “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987, p. 43).

In that report, it was emphasized that environmental degradation, poverty, and social inequalities need to be dealt with immediately. Moreover, it emphasized the importance of acting globally, responsible governance, and integrating sustainability principles into policy-making and decision-making processes. After the publication of the Brundtland Report, sustainable development has become a key concept in international debates and policy frameworks such as United Nations Conference on Environment and Development (UNCED) in 1992. It was adopted ‘’Agenda 21’’ at

UNCED (1992). Agenda 21 is a comprehensive action plans for sustainable development worldwide. Agenda 21 outlines strategies for addressing global environmental and development challenges through the cooperation of governments, the private sector, and civil society (UNCED, 1992). Agenda 21 is a 351-page document consisting 4 sections with 40 chapters. Section 1 of *Agenda 21*, titled "Social and Economic Dimensions," includes eight chapters: Preamble, International Cooperation to Accelerate Sustainable Development in Developing Countries and Related Domestic Policies, Combating Poverty, Changing Consumption Patterns, Demographic Dynamics and Sustainability, Protecting and Promoting Human Health, Promoting Sustainable Human Settlement Development, and Integrating Environment and Development in Decision-Making (UNCED, 1992, pp. 7-39). Section 2 of *Agenda 21*, titled titled "Conservation and Management of Resources for Development " includes 14 chapters : “Protection of the Atmosphere, Integrated Approach to the Planning and Management of Land Resources, Combating Deforestation, Combating Desertification and Drought, Sustainable Mountain Development, Promoting Sustainable Agriculture and Rural Development, Conservation of Biological Diversity, Environmentally Sound Management of Biotechnology, Protection of the Oceans, All Kinds of Seas, and Coastal Areas, Protection of the Quality and Supply of Freshwater Resources, Environmentally Sound Management of Toxic Chemicals, Environmentally Sound Management of Hazardous Wastes, Environmentally Sound Management of Solid Wastes and Sewage-Related Issues, and Safe and Environmentally Sound Management of Radioactive Wastes” (UNCED, 1992, pp. 40-119). Section 3 of *Agenda 21*, titled "Strengthening the Role of Major Groups," includes 10 chapters: “Preamble, Global Action for Women Towards Sustainable and Equitable Development, Children and Youth in Sustainable Development, Recognizing and Strengthening the Role of Indigenous People and Their Communities, Strengthening the Role of Non-Governmental Organizations (NGOs), Local Authorities’ Initiatives in Support of Agenda 21, Strengthening the Role of Workers and Their Trade Unions, Strengthening the Role of Business and Industry, Scientific and Technological

Community, and Strengthening the Role of Farmers" (UNCED, 1992, pp. 120-177). Section 4 of *Agenda 21*, titled "Means of Implementation," includes eight chapters: "Financial Resources and Mechanisms, Technology Transfer, Cooperation and Capacity-Building, Science for Sustainable Development, Promoting Education, Public Awareness and Training, International Cooperation for Capacity-Building in Developing Countries, International Institutional Arrangements, International Legal Instruments and Mechanisms, and Information for Decision-Making" (UNCED, 1992, pp. 178-351). To conclude, Agenda 21 is seen as a cornerstone of global efforts toward sustainable development since it provides a framework for nations to work together to address environmental degradation, poverty, and inequality, while promoting economic growth in a sustainable manner (e.g. Selin & VanDeveer, 2012; Leal Filho, 2000).

After eight years in 2000, United Nations declared *The Millennium Development Goals (MDGs)* (United Nations, 2000). It includes eight goals which are Eradicate extreme poverty and hunger, Achieve universal primary education, Promote gender equality and empower women, Reduce child mortality, Improve maternal health, Combat HIV/AIDS, malaria, and other diseases, Ensure environmental sustainability, Develop a global partnership for development (United Nations, 2000). The target year for achieving these goals was 2015. To evaluate the outcomes of the Millennium Development Goals (MDGs), *The Millennium Development Goals Report 2015*, published by the United Nations (2015). This report reviews how the world has progressed towards the eight goals by 2015. According to this report, significant global improvements had been made, but some goals particularly those related to poverty, gender inequality, health, and environmental sustainability were not fully achieved by 2015 (United Nations, 2015). According to the report (2015), especially in Sub-Saharan Africa and parts of South Asia, around 836 million people still face extreme poverty and about 795 million people globally still experienced chronic hunger, progress has been not equal across regions, therefore goal one which is *eradicate extreme poverty and hunger* were not fully achieved by 2015. Moreover, Report highlights that Although there has been significant success in reducing the

gender gap in elementary and secondary education, there is still gender inequality and in many countries, women still struggle to fully participate in the workforce therefore goal three which is *Gender Equality and Women's Empowerment* was not fully achieved by 2015 (United Nations, 2015). Reports also highlight that goal four which is *Reduce Child Mortality* was not fully achieved by 2015 since although there has been a 50% reduction in under-five child mortality rates since 1990, 16,000 children under five still died every day in 2015, many of them from avoidable causes (United Nations, 2015). Moreover, although maternal mortality rates were reduced by 45% globally, accessing to reproductive health services is inadequate especially in rural and poor areas, therefore goal five which is *Improve Maternal Health Empowerment* was not fully achieved by 2015 (United Nations, 2015). Reports implies that goal six which is *Combat HIV/AIDS, Malaria, and Other Diseases* was not fully achieved by 2015 since although significant progress has been made in the fight against HIV/AIDS, malaria, and other diseases, HIV infection rates are still high particularly in Sub-Saharan Africa (United Nations, 2015). Reports implies that goal seven which is *Ensure Environmental Sustainability* was not fully achieved by 2015 since although access to clean drinking water and sanitation has improved, deforestation rates remained high in certain regions and global carbon emissions continued to rise, hampering efforts to combat climate change, while biodiversity loss and ecosystem degradation remained significant problems (United Nations, 2015).

After two years of publication MDGs, in 2002 World Summit on Sustainable Development (WSSD), held in Johannesburg, South Africa, with leaders from various sectors, including government, civil society, and the private sector (United Nations, 2002). The WSSD aimed to address the urgent issues of poverty, environmental degradation, and sustainable development (United Nations, 2002). The Johannesburg Plan of Implementation (JPOI), often referred to as Agenda 21+, is a key outcome of the World Summit on Sustainable Development (WSSD), was adopted as a framework for action to enhance sustainable development (United Nations, 2002). It emphasized the importance of implementing the commitments

outlined in Agenda 21 and developing new initiatives to tackle emerging challenges (United Nations, 2002). JPOI is divided into several key thematic areas:

1) Poverty Eradication: JPOI makes a direct connection between poverty reduction and sustainable development, emphasizing that addressing poverty is critical for achieving environmental and economic sustainability (United Nations, 2002).
2) Changing Unsustainable Patterns of Consumption and Production: This section emphasizes the importance of developed countries leading the way in promoting sustainable consumption patterns, moreover it highlights all nations should adopt technologies and practices that reduce resource use (United Nations, 2002).
3) Water, Sanitation, and Energy: JPOI implies that access to water, sanitation and energy are essential for sustainable development and aims to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015 (United Nations, 2002).
4) Sustainable Agriculture: it also highlights that sustainable agricultural practices are encouraged to provide food security, conserve natural resources, and protect biodiversity (United Nations, 2002).
5) Biodiversity Protection: Commitment to protect and restore ecosystems and stop biodiversity loss through integrated environmental management approaches (United Nations, 2002).
6) Sustainable Development: JPOI highlights Africa's and other regional initiatives, small island developing states particular challenges and calls for special attention to African development needs(United Nations, 2002). Additionally, JPOI established a foundation for future discussions that led to the creation of the Sustainable Development Goals (SDGs) in 2015.

Rio+20, also known as the United Nations Conference on Sustainable Development, was held in Rio de Janeiro, Brazil in 2012 (United Nations, 2012). It published a document which is "The Future We Want" outlining specific and practical steps for implementing sustainable development (United Nations, 2012). Rio+20 conference

promoted the idea of a green economy in the context of sustainable development and poverty eradication (United Nations, 2012). Moreover, it emphasised the importance of strengthening institutions and governance at the international, regional, and national levels (United Nations, 2012). Furthermore, member countries agreed to initiate creation set of Sustainable Development Goals (SDGs), which will expand on the Millennium Development Goals and align with the post-2015 development agenda (United Nations, 2012). The transition from the Millennium Development Goals (MDGs) to the Sustainable Development Goals (SDGs) represents a significant shift in the global development agenda which broadens the scope of global targets (Fukuda-Parr, 2016). Although The MDGs were primarily designed as a set of measurable targets to reduce poverty in developing countries the SDGs apply to all countries, developed and developing countries moreover The SDGs emphasize the interconnectedness of economic, social, and environmental dimensions (Fukuda-Parr, 2016).

The 2030 Agenda for Sustainable Development was adopted by the United Nations General Assembly on September 25, 2015. This agenda is a global roadmap for a more sustainable future, aiming to eradicate poverty, protect the planet, and ensure prosperity for all by 2030 (United Nations, 2015). The Sustainable Development Goals (SDGs) consist of 17 goals and 169 targets that were adopted by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development (United Nations, 2015). The SDGs provide a comprehensive framework to address various dimensions of sustainable development, including social, economic, and environmental aspects. These three aspects also known as three pillars of sustainable development in the literature (e.g.: UNESCO ,2005).

A detailed description of three pillars of sustainable development by UNESCO:

> Society: an understanding of social institutions and their role in change and development, as well as the democratic and participatory systems which give the opportunity for the expression of opinion, the selection of governments, the forging of consensus and the resolution of differences.
>
> Environment: an awareness of the resources and fragility of the physical environment and the effects on it of human activity and decisions, with a commitment to factoring environmental concerns into social and economic policy development.
>
> Economy: a sensitivity to the limits and potential of economic growth and their impact on society and on the environment, with a commitment to assess personal and societal levels of consumption out of concern for the environment and for social justice (UNESCO, 2005, p. 5).

These three dimensions includes fifteen perspectives/subthemes. The fifteen strategic perspectives listed below, and the linkages between them, must inform learning and education for sustainable development (UNESCO,2005)

Society dimension includes the perspectives Human rights; Peace and human security; Gender equality; Cultural diversity and intercultural understanding; Health, HIV/AIDS; Governance. environment dimension includes the perspectives Natural resources (water, energy, agriculture, biodiversity), Climate change, Rural development, Sustainable urbanisation, Disaster prevention and mitigation (UNESCO,2006). Economic dimension includes the perspectives Poverty reduction, corporate responsibility and accountability, Market economy (UNESCO,2006).

There are seventeen Sustainable development goals (United Nations, 2015). These are:

> Goal 1: No Poverty "End poverty in all its forms everywhere."
> Goal 2: Zero Hunger "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture."
> Goal 3: Good Health and Well-Being "Ensure healthy lives and promote well-being for all at all ages."
> Goal 4: Quality Education "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."
> Goal 5: Gender Equality "Achieve gender equality and empower all women

and girls."
Goal 6: Clean Water and Sanitation "Ensure availability and sustainable management of water and sanitation for all."
Goal 7: Affordable and Clean Energy "Ensure access to affordable, reliable, sustainable, and modern energy for all."
Goal 8: Decent Work and Economic Growth "Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all."
Goal 9: Industry, Innovation, and Infrastructure "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation."
Goal 10: Reduced Inequality "Reduce inequality within and among countries."
Goal 11: Sustainable Cities and Communities "Make cities and human settlements inclusive, safe, resilient, and sustainable."
Goal 12: Responsible Consumption and Production "Ensure sustainable consumption and production patterns."
Goal 13: Climate Action "Take urgent action to combat climate change and its impacts."
Goal 14: Life Below Water "Conserve and sustainably use the oceans, seas, and marine resources for sustainable development."
Goal 15: Life on Land "Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss."
Goal 16: Peace, Justice, and Strong Institutions "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels."
Goal 17: Partnerships for the Goals "Strengthen the means of implementation and revitalize the global partnership for sustainable development." (United Nations, 2015, p.16).

The 2030 Agenda for Sustainable Development is a plan to address major issues such as poverty, inequality, pollution and climate change and it emphasizes that everyone should not be left behind in their pursuit of prosperity and good life (United Nations, 2015). The 17 Sustainable Development Goals (SDGs) provide a roadmap to help countries develop policies which are appropriate to their own circumstances and encourage international cooperation (United Nations, 2015). It also emphasizes local ownership so that each country can find solutions that are appropriate for its own specific challenges (United Nations, 2015). The agenda 30 also recognizes the importance of innovative financing and technology transfer to support developing

countries (United Nations, 2015). It also aims to increase economic growth and reduce environmental impacts by encouraging investments in sustainable infrastructure, education and health systems (United Nations, 2015). It also calls for urgent action on climate change and offers a shared vision for a better world and calls on everyone to rethink their approaches for sustainable development. Its success depends on collective action, determination and a perspective that prioritizes people and the planet. Agenda 30 also states that success depends on collective action, determination and a perspective a transformative mindset that puts people and the planet at the centre of decision-making processes (United Nations, 2015).

2.2 Education for Sustainable Development

Education for Sustainable Development (ESD) was first discussed at the international level during the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, held in Rio de Janeiro, Brazil in 1992. At the Earth Summit, world leaders, policymakers, and stakeholders met to address pressing environmental and development challenges. One of the outcomes of the Earth Summit was the adoption of Agenda 21 which is a comprehensive plan of action for sustainable development. Chapter 36 of Agenda 21 specifically focused on education, public awareness, and training by recognizing the importance of education in achieving sustainable development goals. Furthermore, it emphasized the importance of promoting education for sustainable development as a key strategy for fostering sustainable development (United Nations, 1992). Since then, Education for Sustainable Development has gained significant attention and recognition at the global level.

In 2002, the United Nations General Assembly declared the United Nations Decade of Education for Sustainable Development (2005-2014) with UNESCO as the lead agency., aiming to integrate sustainability principles into educational systems worldwide (United Nations General Assembly, 2002). Moreover, this declaration emphasized the importance of ESD as a transformative educational approach. By the

end of the decade, it was clear that DESD had been successful in increasing global policy adoption and awareness of ESD (UNESCO, 2014).

Additionally, The United Nations Conference on Sustainable Development (Rio+20) highlighted the need to expand and strengthen ESD efforts globally (United Nations, 2012). It caused the establishment of the Global Action Programme (GAP), which is a framework for implementing ESD at all levels and across various sectors, on ESD (UNESCO, 2014).

In 2015, the *Sustainable Development Goals (SDGs)* were adopted, embedding ESD into the global agenda. Goal 4 is ‘’ Quality Education "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (United Nations, 2015, p. 17). It includes ten targets which are:

> 4.1: "By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes."
>
> 4.2: "By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education."
>
> 4.3: "By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university."
>
> 4.4: "By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship."
>
> 4.5: "By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations."
>
> 4.6: "By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy."
>
> 4.7: "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development."
>
> 4.a: "Build and upgrade education facilities that are child, disability and gender-sensitive and provide safe, non-violent, inclusive and effective learning environments for all."

> 4.b: "By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing states and African countries, for enrolment in higher education."
>
> 4.c: "By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries." (United Nations, 2015, pp. 19-20).

After the conclusion of the Decade of Education for Sustainable Development (DESD), UNESCO launched the Global Action Programme on Education for Sustainable Development (GAP on ESD), which ran from 2015 to 2019 (UNESCO, 2015).. This program aimed to build on the successes of DESD by focusing on five key areas: policy support, whole-institution approaches, capacity building for educators, youth empowerment, and the engagement of local communities (UNESCO, 2015). Although the Global Action Programme (GAP) ended in 2019, efforts to promote sustainable education continued through the 2030 Agenda for Sustainable Development. However, the COVID-19 pandemic that started in late 2019 disrupted education around the world. To address this, UNESCO and its partners launched initiatives like the Global Education Coalition to ensure access to education during the crisis. This situation highlighted the need for strong and inclusive education systems (UNESCO, 2020). While these efforts weren't part of a formal "decade," they set the stage for the 2020–2030 Decade of Action Plan and speeded up progress toward the Sustainable Development Goals (SDGs) (United Nations, 2020).From 2015 to 2019, the GAP on ESD achieved significant outcomes, particularly in strengthening policy frameworks and integrating ESD into educational systems (UNESCO, 2019). After 2019, UNESCO launched the ESD for 2030 framework which is designed to support the 2030 Sustainable Development Goals (SDGs). This framework builds on the achievements of the Global Action Programme (GAP) and it aims to deepen the integration of ESD into policies and learning environments, helping to achieve the broader goals of the SDGs by 2030 (UNESCO, 2020). By integrating education for sustainable development into education systems, societies can raise individuals who are environmentally

conscious, socially responsible, and equipped with the skills and knowledge needed to address the complex challenges of the 21st century (UNESCO, 2017). According to UNESCO (2017), ESD encompasses various topics, including environmental conservation, social justice, poverty alleviation, climate change, biodiversity, sustainable agriculture, renewable energy, responsible consumption, and global citizenship. Moreover, aim of ESD is to integrate these themes into the educational curriculum and create learning experiences that include raising awareness, fostering skills and competencies, promoting active citizenship (UNESCO, 2017). Raising awareness is essential for ESD. Sustainability Consciousness (SC) defined by Gericke et al as "experience or awareness of sustainability phenomena" (2019, p.37). Therefore, it is important to raise individuals which have sustainability consciousness to promote sustainable development.

2.2.1 Sustainability Consciousness

Bloom, Engelhart, Furst, Hill, and Krathwohl defined cognitive domain as "The domain, includes those objectives which deal with there call or recognition of knowledge and the development of intellectual abilities and skills" (1956, p.7). The cognitive domain is an important aspect of education because it focuses on the development of students' thinking abilities as well as their ability to understand, analyse, and apply information (Bloom et al, 1956). Bloom et al defines Affective Domain as the "domains include objectives which describe changes in interest, attitudes, and values, and the development of appreciations and adequate adjustment" (1956, p.7). The affective domain is concerned with emotions, attitudes, values, and beliefs that influence an individual's learning and behavior (Bloom et al, 1956). It entails the development of emotional and social skills as well as the formation of positive attitudes toward learning and the subject matter (Bloom et al, 1956). Therefore, the affective domain is critical in determining students' motivation, engagement, and willingness to actively participate in the learning process.

According to the Decade of Education for Sustainable Development (DESD) 2005–2014, “basic education needs to focus on sharing knowledge, skills, values, and perspectives throughout a lifetime of learning in such a way that it encourages sustainable livelihoods and supports citizens to live sustainable lives” (UNESCO, 2005, p. 5). The purpose of DESD was to prepare individuals with knowledge, skills, values, and attitudes required to contribute to sustainable development (UNESCO,2005). It aimed to create a holistic concept of sustainable development that considered environmental, social, and economic dimensions (UNESCO,2005). UNESCO (2017) published fifteen learning objectives in three domains which are cognitive, socio-emotional and behavioural for each Sustainable Development Goal. Every domain includes 5 learning objectives. Moreover, the list of suggested subjects and educational strategies is provided for each SDG. In this report, learning objectives are defined for each SDG in the cognitive, socio-emotional, and behavioural domains (UNESCO, 2017). Moreover, the report defines cognitive domain which includes the knowledge and thinking abilities required to better grasp the SDG and the problems associated with accomplishing it (UNESCO, 2017). Report defines the socio-emotional domain, which contains social skills that allow learners to interact, negotiate, and communicate in order to promote the SDGs, as well as self-reflection skills, values, attitudes, and motivations that will enable learners to grow, which cover the affective domain (UNESCO, 2017). Report defines behavioral domain which encompasses action competencies (UNESCO, 2017). Moreover, report emphasised ESD must be immersive and focus on more than knowledge (UNESCO, 2017). ESD must also “focus on students’ values and behaviors as an effective method for motivating sustainable behaviors and improving problem solving” (Pappas et al., 2013, p. 62). Therefore, Gericke et al (2019) used the term knowingness instead of knowledge. While “knowledge” is the understanding of facts and information, “knowingness” involves a deeper level of comprehension, critical thinking, and practical application of knowledge, thus “knowingness has both a cognitive, knowledge-based component and an affective-based component” (Gericke et al., 2019,p. 38).

Sustainability Consciousness (SC) defined by Gericke et al. as “experience or awareness of sustainability phenomena” (2019, p. 37). Moreover, Berglund et al. (2014) defined the concept which is Sustainability Consciousness (SC). According to their definitions, Sustainability Consciousness (SC) aims to integrate cognitive and affective domains and includes all three pillars of sustainable development which are social, environmental and economic (2014).

Berglund et al (2014) aim to investigate the finding students’ SC by using holistic approach which includes to connecting the three pillars of sustainable development with knowingness, attitudes, and behaviours. Because they argue that previous studies focused on just environmental dimension (e.g. Sánchez & Lafuente, 2010), or three dimensions of SD with just on cognitive or affective domain. However, their study is the first study to examine the three pillars of SD connected both with cognitive (knowingness) and affective domain (attitude and behavior).

Michalos et al. (2012) developed instrument to measure knowingness, attitude, and behaviour which is called Sustainability Consciousness Questionnaire (SCQ). then, Gericke et al. (2019) revised it “based on UNESCO (2006, 2015) subthemes. SCQ can be used for all ages from15-year-old” (Gericke et al., 2019, p.39). Also in Turkish context it is used for high school students (Yüksel &Yıldız,2019). There is two version of this instrument as Sustainability Consciousness Questionnaire Long (SCQ-L) and Sustainability Consciousness Questionnaire Short (SCQ-S). SCQ was adapted into Turkish by Yüksel and Yıldız in 2019. The scale consists of 50 items and 3 subscales (Knowingness, Attitude and Behavior). Each subscale consists of economic, social and environmental dimensions. The scale is in the structure of a 5-point Likert scale varying between “strongly agree” and “strongly disagree”. The inclusion of the three psychological constructs of knowingness (K), attitudes (A), and behavior (B) in the SCQ allows for a more holistic assessment of people's cognitive and affective perceptions of SD (Gericke et al., 2019). The K segment incorporates what people recognize as SD's necessary features (Gericke et al., 2019. Section A reflects the attitudes of individuals toward the SD issues under discussion, while Section B reflects what people do about the SD issues under review. These

three psychological components are then tied to the three SD dimensions (environment, society, and economy) in the SCQ instrument (Gericke et al., 2019). As a result, the questionnaire has nine subfactors (KENV, KSOC, KECO, AENV, ASOC, AECO, BENV, BSOC,BECO), as shown in Figure below (Gericke et al., 2019 ,p.39). Furthermore, the items in the SCQ cover the entire spectrum of UNESCO's 15 subthemes of SD (UNESCO, 2005).

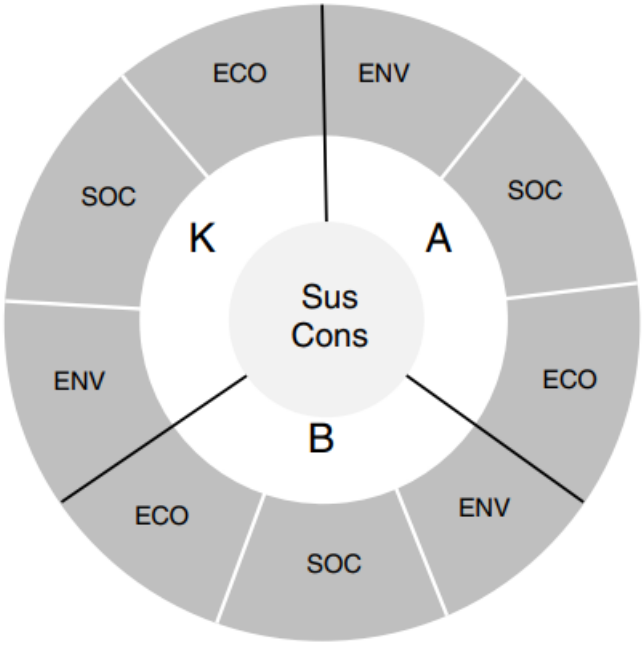

Figure 2.1 "*Conceptual representation of sustainability consciousness. K = knowingness; A = attitudes; B = behaviour; ECO = economic; SOC = social; ENV = environmental; Sus Cons = sustainability consciousness"* (Gericke et al., 2019, p. 30).

2.3 Models Explaining Sustainable Behavior

Sustainable behavior and environmental behavior are often overlapping concepts, but they have fundamental differences. Environmental behavior refers to individual or social actions that directly affect the environment and includes practices aimed at protecting nature (Steg & Vlek, 2009). Sustainable behavior defined as "actions taken to reduce environmental impacts while also promoting social and economic well-being" (Axelsson et al., 2013, p. 5). Therefore, sustainable behavior includes environmental factors, but also economic and social dimensions. Juárez-Nájera (2015) states that models explaining environmental behavior can also be used to explain sustainable behavior. There are many models explaining environmental behavior and sustainable behavior. In this section, the following models are represented: Knowledge, Attitude, Behavior (KAB) Model, Models of predictors of environmental behavior by Hines, Hungerford and Tomera (1987), The Value-Belief-Norm (VBN) theory, The Theory of Reasoned Action (TRA) and Theory of planned behaviour (TPB). Juárez-Nájera (2015) states that these models can be helpful when examining predictors of sustainable behavior

2.3.1 Knowledge, Attitude, Behavior (KAB) Model

The Knowledge, Attitude, Behavior (KAB) Model is a framework used to understand how knowledge, attitudes, and behaviors interact in shaping human actions and decision-making. KAB model states that knowledge influence attitude that leads to behavior change (Hungerford & Volk, 1990). This model proposes that an increase in knowledge about a particular topic can lead to changes in attitude, which in turn can influence behavior. It mostly referred as “Early Linear Model” in the context of environmental education (e.g., Kollmus & Agyeman, 2002; Alper, 2014).

Figure 2.2 Early Linear Model for Pro-envrionmental Behavior by Kollmus & Agyeman (2002, p.241).

According to this model, increase in environmental knowledge cause environmental attitude that it turns to act pro environmental behavior. many researchers argue that this model is insufficient to explain pro-environmental behavior because increase in knowledge may not cause increase in behavior (Kollmus & Agyeman, 2002). Due to this reason many models proposed by the researchers to explain the relationship between these variables well. Although it is argued that this model may be insufficient to explain the relationship between knowledge attitude and behavior, it is still mostly used in many areas. Lučić and Uzelac (2024) stated that KAB model "could serve as a suitable framework for investigating sustainable behaviour among young adults as desirable behaviour" (p.3). Therefore, KAB model used in this study as a theoretical framework.

2.3.2 Models of predictors of environmental behavior by Hines, Hungerford and Tomera (1987)

Hines, Hungerford and Tomera (1987) conducted meta-analyses which cover 128 environmental behavior research and proposed a model which explains the factors of environmental behavior. this model states that factors explain environmental behavior are knowledge of issues, knowledge of action strategies, locus of control, attitudes, verbal commitment, and an individual's sense of responsibility (Hines et al., 1987).

Knowledge of Issues: Refers to awareness of environmental problems, their causes, and potential consequences and it is a prerequisite for action; individuals cannot act responsibly if they are unaware of the problem (Hines et al., 1987).

Knowledge of Action Strategies: Involves understanding how to address specific environmental issues (Hines et al., 1987). This includes practical solutions like recycling or using energy-efficient appliances (Hines et al., 1987).

Locus of Control: Belief that one's actions can bring about change (Hines et al., 1987). Individuals with an internal locus of control are more likely to take responsibility and act (Hines et al., 1987).

Attitudes: Embracing positive attitudes and actively taking specific actions toward environmental issues greatly enhances our chances of engaging in environmental behavior (Hines et al., 1987).

Personal Responsibility: A sense of obligation or moral duty to act responsibly towards the environment (Hines et al., 1987).

Intention to Act: serves as a critical mediator between personality traits and actual behavior (Hines et al., 1987). A strong commitment to taking action increases the likelihood of follow-through (Hines et al., 1987).

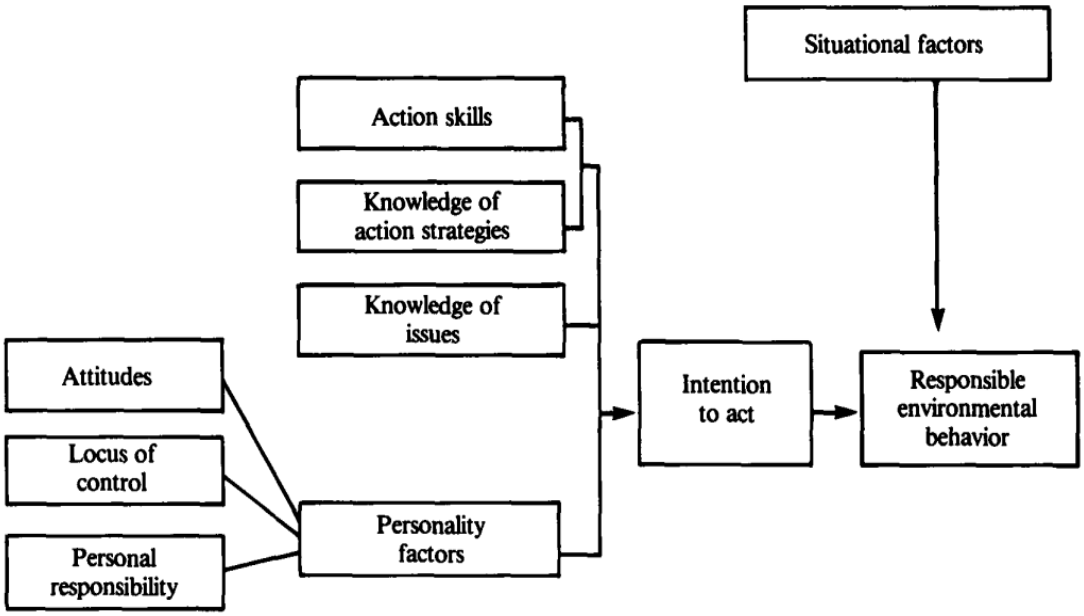

Figure 2.3 Models of predictor of environmental behavior (Hines *et al*., 1987, p. 7).

Moreover, they stated that there are Situational Factors such as Economic Constraints, Social Pressures, Opportunities to Act can either facilitate environmental behavior. Situational factors can override internal factors. For example, even a highly motivated individual may fail to act if situational barriers (e.g., cost, lack of infrastructure) exist.

To sum up, model proposed that knowledge, skills, and personality factors (e.g., attitudes, locus of control) lead to a desire to act and this pathway is moderated by situational factors (e.g., economic constraints, social pressures), which can either inhibit or reinforce behavior.

2.3.3 The Value-Belief-Norm Theory

The Value-Belief-Norm (VBN) theory, developed by Stern et al. (1999), provides a framework to understand the factors which shape environmental behavior. It is rooted in Schwartz's (1970) norm-activation theory, which highlights the role of

personal norms and altruistic values in guiding behavior. norm-activation theory explores how personal and social norms influence prosocial behaviours such as environmental behavior (Schwartz, 1977). VBN is differ from norm activation theory due to its integration of value orientations and ecological beliefs, which link personal norms to broader value systems and environmental worldviews (Stern et al., 1999). The Value-Belief-Norm (VBN) theory explains how individuals' environmental behaviors are driven by a chain of various variables: personal values, ecological beliefs, such as those captured by the New Ecological Paradigm (NEP), awareness of environmental consequences, ascription of responsibility to self, and personal norms for environmental action. The Value-Belief-Norm (VBN) theory states that each variable in the chain can affect directly next variable or other variables came after the variables. The foundation of VBN lies in the concept of value orientations, particularly biospheric, altruistic, and egoistic values, which have roots in work by Rokeach (1973) on human values and their role in guiding behavior (Rokeach, 1973). Stern and colleagues integrated the belief element by introducing the New Ecological Paradigm (NEP) (Dunlap & Van Liere, 1978). New Ecological Paradigm (NEP) is a scale which measures ecological worldviews of people and reflects people's beliefs about human-nature relationships (Dunlap & Van Liere, 1978). The NEP acts as a belief measure linking values to environmental concern, illustrating how value orientations are correlated with specific ecological beliefs. (Dunlap & Van Liere, 1978; Stern et al., 1999). According to the Value-Belief-Norm (VBN) theory, individuals' altruistic values (concern for the welfare of others), biospheric values (concern for the environment and ecosystems), and egoistic values (concern for personal costs and benefits) shape their environmental beliefs(Stern, 2000). Moreover, these beliefs enhance awareness of consequences (AC) and ascription of responsibility (AR), which activate personal norms (feelings of moral obligation), ultimately leading to pro-environmental behaviors (Stern, 2000).

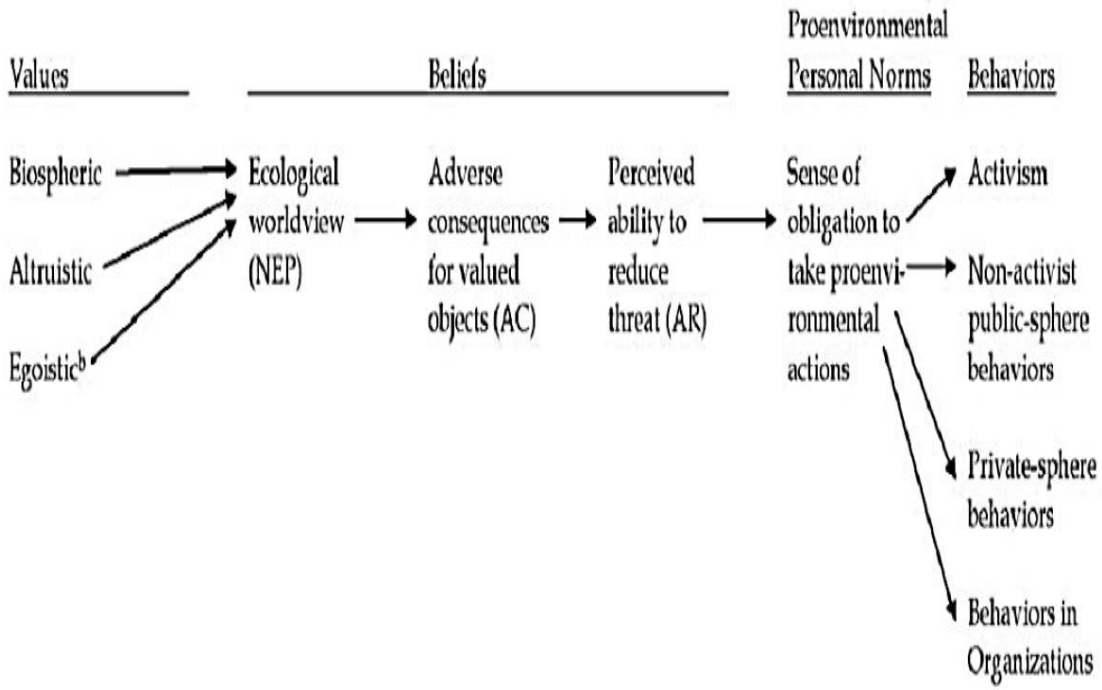

Figure 2.4 Theory of value belief norm (Stern, 2000, p. 84)

2.3.4 The Theory of Reasoned Action (TRA)

The Theory of Reasoned Action (TRA) is developed by Ajzen and Fishbein (1980). The Theory of Reasoned Action states that a person's behavior is mainly influenced by their intention to engage in that behavior, which is affected by two main factors: attitudes towards the behavior and subjective norms (Ajzen & Fishbein, 1980). The model suggests that attitudes reflect an individual's positive or negative evaluation of a behavior, while subjective norms represent perceived social pressures from important others to engage in or avoid the behavior (Ajzen, 1985). Attitudes towards behavior and subjective norms are considered together to determine behavioural intention (Madden, Ellen & Ajzen, 1992).

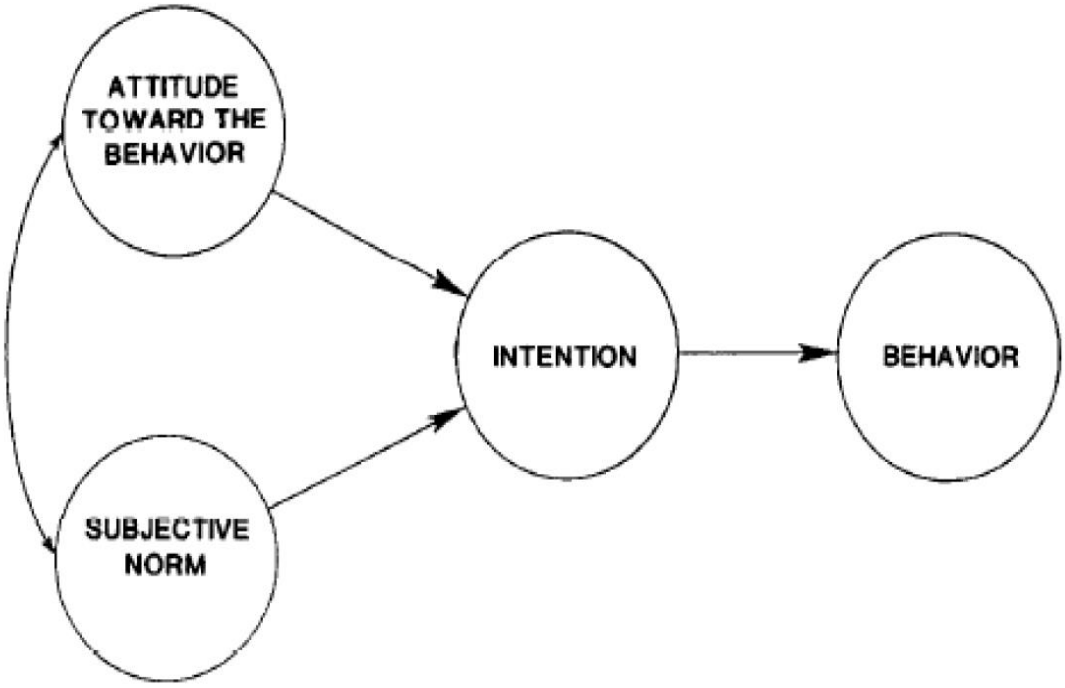

Figure 2.5 The Theory of Reasoned Action (Ajzen & Madden, 1986, p. 454)

Ajzen (1985) emphasized that intention is not always the immediate determinant of behavior, especially when those behaviors are not under volitional control. Consequently, Ajzen developed the Theory of Planned Behavior as a theoretical framework, which will be explained in detail in the next section.

2.3.5 The Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) evolved from Theory of Reasoned Action (TRA) by addressing its limitations, particularly in accounting for behaviors that are not entirely under volitional control (Ajzen, 1991). Ajzen (1985) expanded on the TRA by adding new variable which is perceived behavioral control. Perceived behavioral control refers to an individual's belief in their ability to perform a behavior, considering external factors such as resources and potential obstacles (Ajzen, 1991). According to the TPB, there are three predictors of behavioral

intention. The first predictor is attitudes toward the behavior, which refers to the individual's positive or negative evaluation of performing the behavior (Ajzen, 1991). The second predictor is Subjective norms, which represent the perceived social pressures to perform or not perform the behavior (Ajzen, 1991). The third predictor is perceived behavioral control (PBC), which refers to an individual's belief about the difficulty of realizing behavior (Ajzen, 1991).

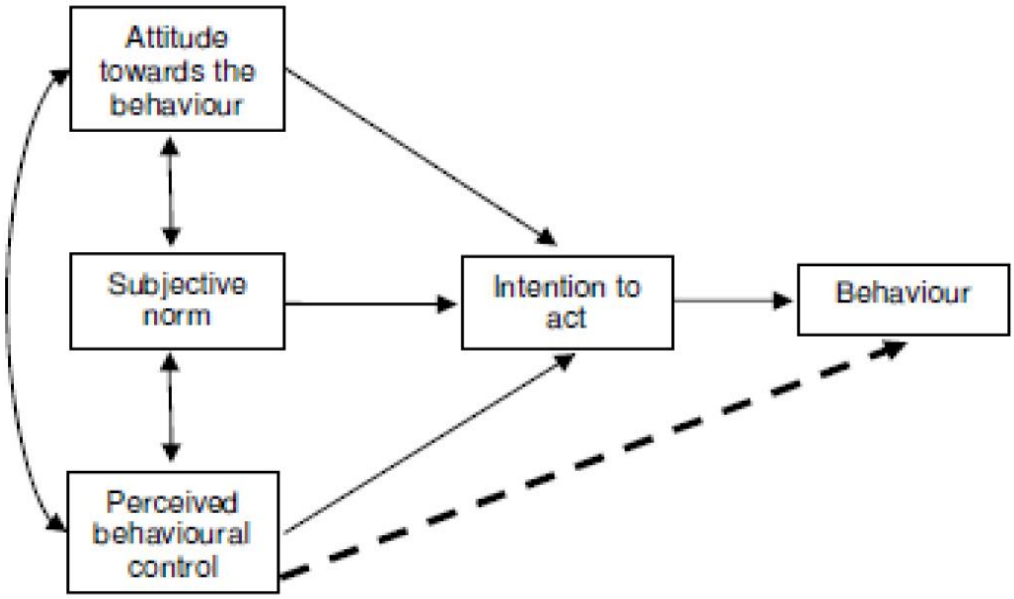

Figure 2.6 Theory of planned behavior (adapted from Ajzen & Madden, 1986, p. 458)

2.4 Studies Related to Sustainability Consciousness: Associated Variables and Gender Difference

Sustainability Consciousness (SC) has become a significant focus in educational research, encompassing dimensions such as knowingness, attitudes, and behaviors toward environmental, social, and economic sustainability. Several studies have

examined SC in various educational settings, highlighting the impact of Education for Sustainable Development (ESD) and the role of gender in shaping sustainability outcomes. In this section, some of these studies reviewed to provide insight into the relationship between SC, ESD, and gender in different contexts.

Abdul-Wahab and Abdo (2010) examined the role of gender, age, and education in shaping the environmental awareness of Omani citizens. The research, involving 425 participants from the Muscat governorate, used a self-administered survey to assess respondents' environmental knowledge, attitudes, and behaviors. Results revealed that males exhibited higher levels of environmental knowledge and were more engaged in environmental behaviors compared to females. Younger respondents, particularly those aged 20 or below demonstrated greater environmental knowledge compared to older groups (31 and above). Additionally, university-educated respondents exhibited the highest levels of environmental knowledge, attitudes, and behaviors compared to those with lower levels of education. The study found that education, gender, and age played a key role in environmental awareness, with higher education levels consistently leading to better knowledge and more involvement in environmental protection activities (Abdul-Wahab & Abdo, 2010).

Teksoz, Sahin, and Tekkaya (2011) aims to model environmental literacy among university students by identifying how environmental knowledge, attitudes, responsibility, concern, and engagement in outdoor activities are interrelated. The study involved 1,345 students from Middle East Technical University in Ankara, Turkey (Teksoz et al., 2011). The sample included students from different faculties, he results indicated that environmental knowledge had a significant positive impact on environmental concern, attitudes, and responsibility (Teksoz et al., 2011). However, a negative relationship was found between environmental knowledge and outdoor activities (Teksoz et al., 2011). Results revealed that environmental attitudes significantly predicted environmental responsibility, and environmental concern was linked to both attitudes and responsibility , while attitudes and concern were important in predicting responsibility (Teksoz et al., 2011). The study suggests that educational programs should not only focus on increasing environmental knowledge

but also create opportunities for students to engage in outdoor activities (Teksoz et al., 2011).

Sahin, Ertepinar, and Teksoz (2012) aimed to examine the relationships among sustainability-related attitudes, values, behaviors, outdoor recreational activities, gender, and media consumption among 958 university students at Middle East Technical University in Turkey via an online survey. Sahin et al. (2012) proposed a model to test the influence of attitudes, values, media consumption, and gender on sustainability behaviors. The findings revealed that gender significantly influenced sustainability-related attitudes and behaviors, with female students showing more favorable attitudes and stronger ecocentric values (Sahin et al., 2012).Moreover, the model showed that media consumption had a positive effect on sustainability attitudes , values, and behaviors with a significant indirect effect of media on sustainability behaviors through outdoor activities and outdoor activities themselves having a direct effect on behaviors (Sahin et al., 2012). Gender also had significant direct effects on attitudes and values in favor of females, while it had a direct effect on outdoor activities in favor of males (Sahin et al., 2012). The study also demonstrated that attitudes towards sustainability had a strong direct effect on behaviors and values with outdoor activities mediating the relationship between attitudes and values (Sahin et al., 2012).

In another study, Sahin (2013) aimed to explain the energy conservation behaviors of Turkish elementary teacher candidates using the Value-Belief-Norm (VBN) Theory. The study sought to determine which psychological attributes, including personal norms, value orientations, and awareness of consequences, were predictors of teacher candidates' energy-saving behaviors. The study also aimed to test the application of VBN theory in predicting energy conservation behaviors in the context of Turkish teacher education with 512 teacher candidates from the Faculty of Education at two public universities in Turkey (Sahin, 2013). The results indicated that the teacher candidates' energy conservation behaviors were primarily predicted by their value orientations and personal norms (Sahin, 2013). Egoistic value orientations were negatively associated with energy conservation behaviors, while

biospheric value orientations and personal norms positively contributed to energy conservation behaviors (Sahin, 2013). The analysis showed that biospheric values had a greater impact on personal norms than altruistic or egoistic values (Sahin, 2013). Furthermore, awareness of consequences and NEP were significant predictors of ascription of responsibility, explaining 33% of its variance ($R^2 = 0.33$) (Sahin, 2013). Interestingly, gender differences did not show significant effects on energy conservation behaviors or the key predictors (Sahin, 2013).

Berglund, Gericke, and Rundgren (2014) conducted a study to explore the impact of ESD on SC among upper secondary students in Sweden. The study involved 638 grade 12 students from science- and social science-related programs. The students were divided into two groups: those attending schools with an ESD approach and those from regular schools without explicit ESD profiles (Berglund et al., 2014). The SC concept was measured with SCQ. The results revealed significant differences in SC between the two groups. The ESD group scored higher in the economic dimension, with a mean score of 3.26 compared to 3.12 (Berglund et al., 2014).. In contrast, no significant differences were found in the environmental and social dimensions. The environmental dimension scores were $M = 3.65$ for the ESD group and $M = 3.60$ for the reference group, while the social dimension scores were $M = 4.09$ for the ESD group and $M = 4.06$ for the reference group (Berglund et al., 2014). Subdimension analysis showed that significant differences were mainly found in Knowingness and Behavior (Berglund et al., 2014). In the economic dimension, students in the ESD group had higher scores in Knowingness ($M = 3.45$ vs. $M = 3.22$, $p < .05$) and Behavior ($M = 3.05$ vs. $M = 2.95$, $p < .05$) (Berglund et al., 2014). In the environmental and social dimensions, differences in Knowingness were also observed but not in Attitudes or Behavior (Berglund et al., 2014). Overall, while this study indicated that ESD implementation had some positive effects on students' SC, particularly in the economic dimension, the effect sizes were generally small (Berglund et al., 2014). This shows that although ESD contributes to improving SC, its current implementation may not fully address all aspects of ESD (Berglund et al., 2014).

Olsson et al. (2015) conducted a study to assess the impact of implementing Education for Sustainable Development (ESD) in Swedish compulsory schools on pupils' sustainability consciousness (SC). Participants included 1,773 pupils from Grades 6 and 9, divided into two groups: ESD-schools, which employed an explicit ESD approach supported by certification programs (e.g., eco-schools), and REF-schools (Regular schools without an explicit ESD approach) (Olsson et al., 2015). They used SCQ to measure pupils' SC. Findings revealed that Grade 6 pupils in ESD-schools demonstrated significantly higher SC compared to pupils in REF-schools, particularly in the environmental dimension (Gericke et al., 2015). A gender difference was also noted, where girls in ESD-schools scored higher than boys in the environmental dimension. Conversely, for Grade 9, REF-schools outperformed ESD-schools overall, with significant differences observed in the social dimension. Additionally, in the economic dimension, ESD-schools positively impacted girls. Although these differences, the overall effect sizes were small, suggesting a limited impact of the explicit ESD approach on SC. The study highlights that there is a need for a more integrated approach in ESD implementation to equally address all sustainability dimensions (Olsson et al., 2015).

Another study is by Olsson and Gericke (2016) explored the phenomenon of the "adolescent dip" in sustainability consciousness (SC) and its implications for ESD. The research investigated whether adolescents (15–16 years old) exhibit a dip in SC, compared to younger (12–13 years old) and older students (18–19 years old). The study included 2,413 Swedish students across Grades 6, 9, and 12, drawn from both ESD-certified schools and regular schools (Olsson & Gericke, 2016). They used SCQ to measure pupils' SC. Study revealed a significant decrease in SC for ninth graders in all three dimensions compared to both sixth and twelfth graders (Olsson & Gericke, 2016). For example, the overall SC scores (EnvEcoSoc KAB) were significantly lower for ninth graders, with small to moderate effect sizes. Specifically, mean differences in the environmental (Env KAB), economic (Eco KAB), and social (Soc KAB) dimensions between Grades 6 and 9 were 0.11, 0.18,

and 0.21, respectively (Olsson & Gericke, 2016). The findings suggest that the dip in SC during adolescence, described as a "time out," is consistent across all sustainability dimensions and SC components. ESD-certified schools did not reduce the decline. In some cases, it even got worse, suggesting there may be issues with how ESD is being applied. (Olsson & Gericke, 2016).

Berglund and Gericke (2016) conducted a study to investigate the views of Swedish upper secondary students on SD. This study, involving 638 students aged 18–19 from science and social science programs. researchers aimed to explore how students perceive the environmental, social, and economic dimensions of SD from both separated and integrated perspectives. The study employed a survey instrument consisting of two parts: one assessing Knowingness, Attitudes, and Behaviors (KAB) separately for each SD dimension, and another evaluating students' decision-making in real-life scenarios involving choices among these dimensions.The findings revealed significant differences in SC across the three dimensions. In the separated perspective, the environmental dimension showed intermediate scores, with Knowingness (M = 3.80), Attitudes (M = 3.95), and Behaviors (M = 4.02). The social dimension had the highest mean scores, with Knowingness (M = 4.10), Attitudes (M = 4.25), and Behaviors (M = 4.15). Conversely, the economic dimension displayed the lowest scores: Knowingness (M = 3.60), Attitudes (M = 3.70), and Behaviors (M = 3.55). Gender differences were statistically significant across all dimensions (Berglund & Gericke, 2016). For the environmental dimension, females outperformed males in Knowingness (Md = 3.85 vs. Md = 3.65), Attitudes (Md = 4.00 vs. Md = 3.88), and Behaviors (Md = 4.10 vs. Md = 3.89). Additionally, results indicated a significant effect of gender. The social dimension similarly showed higher mean scores for females in Knowingness (Md = 4.15 vs. Md = 4.05), Attitudes (Md = 4.30 vs. Md = 4.18), and Behaviors (Md = 4.20 vs. Md = 4.09). In the economic dimension, the gender gap was narrower but still significant in Knowingness (Md = 3.65 vs. Md = 3.55) and Attitudes (Md = 3.75 vs. Md = 3.65). Researchers argue that integrated perspective revealed a shift in priorities depending on context. When asked to make decisions about issues like global warming or waste

management, students mainly focused on environmental factors, then social and economic ones. This approach showed that the conflicts between these factors indicate decisions in sustainability depend on the situation. (Berglund & Gericke, 2016).

In another study, researchers aim to examine the relationship between sustainability knowledge and pro-environmental behaviors, challenging the common "knowledge deficit model" that assumes a lack of knowledge leads to unsustainable behaviors (Heeren et al., 2016). The researchers apply the Theory of Planned Behavior (TPB) to assess how sustainability knowledge, along with attitudes, norms, and perceived behavioral control (PBC), influences sustainable behavior among university students (Heeren et al., 2016). The data was collected from over 500 students at Ohio State University. The sample included students from various academic disciplines. Gender differences were found in knowledge scores, with males scoring slightly higher than females (Heeren et al., 2016). There were also political differences in sustainability knowledge, with Democrats scoring higher than Republicans (Heeren et al., 2016). Study also revealed that Attitudes, norms, and PBC were stronger predictors of behavior (Heeren et al., 2016). Moreover, models showed that PBC and norms significantly predicted sustainable behaviors, while sustainability knowledge was not a significant predictor after controlling for these variables. Furthermore, Gender differences showed that females had significantly higher engagement in sustainable behaviors than males (Heeren et al., 2016). Political affiliation also influenced knowledge scores, with Republicans scoring lower than Democrats (Heeren et al., 2016). The study concluded that while sustainability knowledge is related to behavior, it is not a significant predictor of pro-environmental actions when other factors (attitudes, norms, and PBC) are accounted for (Heeren et al., 2016).

Oztekin, Teksöz, Pamuk, Sahin, and Kilic (2017) aimed to assess the recycling behavior of participants based on the Theory of Planned Behavior (TPB), using both a combined model for all participants and separate models for males and females. The analysis of overall model revealed that attitude and perceived behavioral control (PBC) were significant predictors of intention to recycle across the entire sample

(Oztekin et al., 2017). Specifically, attitudes had a strong positive effect and PBC also significantly influenced intention, moreover, Past behavior had a moderate influence on intention (Oztekin et al., 2017). For female participants, the model revealed that PBC was the most significant predictor of intention to recycle, followed by attitude and subjective norms had a moderate effect on intention, while past behavior was not a significant predictor of intention to recycle (Oztekin et al., 2017). For male, past behavior emerged as the most significant predictor of intention to recycle, followed by attitudes and PBC had a smaller effect on intention, subjective norms were not a significant predictor for males (Oztekin et al., 2017). For male, past behavior emerged as the most significant predictor of intention to recycle, followed by attitudes (Oztekin et al., 2017). Moreover, PBC had a smaller effect on intention, and subjective norms were not a significant predictor for males (Oztekin et al., 2017). To conclude, the study highlights that females are more influenced by attitudes and perceived behavioral control, while males are more influenced by past behavior (Oztekin et al., 2017).

Olsson and Gericke (2017) conducted a study in Sweden to examine gender differences in students' SC. The sample included 2,413 students aged 12 to 19, from grades six, nine, and twelve, drawn from both ESD-certified and non-ESD-certified schools. The study found that in the environmental dimension, girls consistently outperformed boys across all grades. Specifically, in grade six, girls scored higher than boys. In grade nine, girls' scores increased while boys scored lower. In grade twelve, the gender gap widened, with girls scoring ($M = 4.02$) and boys scoring ($M = 3.72$). In the social dimension, girls consistently scored higher than boys across all grades. In grade six, girls scored higher than boys. In grade nine, girls scored higher than boys. In grade twelve, the gap remained, with girls scoring higher than boys. In the economic dimension, gender differences were smaller. In grade six, girls scored $M = 3.73$ while boys scored $M = 3.72$. In grade nine, the scores were nearly identical: girls scored ($M = 3.59$) and boys scored ($M = 3.57$). In grade twelve, the difference increased slightly, with girls scoring $M = 3.71$ and boys scoring $M = 3.63$. Notably, gender differences were more observed in ESD-certified schools. In the

environmental dimension, girls scored higher than boys in ESD-certified schools, while in non-ESD schools, girls scored higher than boys. Similarly, in the social dimension, girls scored higher than boys in ESD-certified schools, while non-ESD schools girls scored higher than boys (Olsson & Gericke, 2017). In the economic dimension, girls scored higher than boys scored in ESD-certified schools, while in non-ESD schools, the difference was negligible: girls scored (M = 3.64) and boys scored (M = 3.63). Overall, the results revealed that girls outperformed boys in all dimensions of SC, and the gender gap increased with age. Olsson and Gericke (2017) emphasised that these differences were especially pronounced in ESD-certified schools indicate ESD practices may inadvertently reinforce gender disparities. The findings highlight the need for more transformative approaches to sustainability education to promote gender equity (Olsson & Gericke, 2017).

Another study, conducted with 823 students, with a predominance of females, undergraduate students to explore SC (Al-Naqbi & Alshannag, 2017). Findings revealed that female students had higher levels of sustainable knowingness compared to male statistically significant. Regarding sustainable attitudes, female students outperformed male students, however, this difference was not statistically significant showing that gender did not significantly influence sustainable attitudes (Al-Naqbi & Alshannag, 2017). In terms of sustainable behaviors, gender and nationality difference were not observed (Al-Naqbi & Alshannag, 2017). The study highlights that while gender difference, both genders exhibit similar positive attitudes towards sustainability (Al-Naqbi & Alshannag, 2017). However, gender and nationality did not significantly influence students' behaviors toward sustainable development, pointing to the complexity of translating knowingness and attitudes into action (Al-Naqbi & Alshannag, 2017).

Whitley, Takahashi, Zwickle, Besley, and Lertpratchya, (2018) applied the Value-Belief-Norm (VBN) Theory to understand the sustainability behaviors of college students. The study aimed to explore how values, beliefs, and norms influence behaviors related to sustainability. The study's results indicated that students who adhered to biospheric and altruistic values were more likely to engage in

sustainability behaviors, while those with egoistic values were less likely to engage in these behaviors (Whitley et al., 2018). The VBN model demonstrated that values, particularly biospheric values, were consistently associated with sustainable behaviors (Whitley et al., 2018). Additionally, Whitley et al. (2018) stated egoistic values negatively impacted pro-environmental behaviors. The total effects for the behaviors were also calculated, and values were consistently influential across all sustainability behaviors, with biospheric values showing the strongest positive associations across multiple behaviors (Whitley et al., 2018).

In another study, Domínguez-Valerio, Moral-Cuadra, Medina-Viruel, & Orgaz-Agüera, (2019) explores the role of attitude as a mediator between sustainable knowingness and sustainable behavior among 741 high school students in the Dominican Republic. The study the results showed that while sustainable knowingness did not directly influence behavior, attitude acted as a full mediator (Domínguez-Valerio et al., 2019). Knowledge positively influenced attitude, and attitude, in turn, positively affected behavior, with the total effect of knowledge on behavior being significant through attitude (Domínguez-Valerio et al., 2019). These findings underscore the importance of fostering positive attitudes toward sustainability as a means to encourage sustainable behaviors, moreover,the study highlights the role of education in shaping attitudes and behavior for sustainable development and suggests that educational programs should focus on enhancing students' attitudes toward sustainability in addition to providing knowledge (Domínguez-Valerio et al., 2019).

Olsson et al. (2019) investigated how the Green School Partnership Project (GPPT) influenced students' SC. This study was conducted with of 1,741 students from Grades 6, 9, and 12 in both GPPT and non-GPPT schools and SCQ used to measure students’ SC. Mean of SC score was 3.95, with GPPT students scoring a little higher than non-GPPT students, though the difference wasn’t significant. In Grade 6, SC was highest overall (M = 4.06), and GPPT students had slightly higher scores in all subthemes, including knowingness, attitudes, and behaviors. However, the differences were not significant. By Grade 9, SC dropped to 3.90, showing the

"adolescent dip" with GPPT students scoring slightly lower than non-GPPT students. This decrease was most apparent in sustainable behaviors. In Grade 12, SC partially recovered (M = 3.91), with GPPT students scoring slightly higher, especially in behaviors. Overall, while GPPT students had slightly higher SC scores, the differences weren't significant. The study highlighted the persistent adolescent dip, particularly in behaviors, and suggested the need for better interventions to engage adolescents in sustainability practices Olsson et al. (2019).

Marcos-Merino et al. (2020) assessed sustainability knowingness, attitudes, and behaviors across three dimensions: environmental, social, and economic by using SCQ. The study found that sustainability knowingness was highest in the social dimension, with Ksoc (social knowingness) having a mean of M = 4.60, followed by Kenv (environmental knowingness with M = 4.41 and Keco (economic knowingness) with M = 4.32 (Marcos-Merino et al., 2020). Regarding sustainable attitudes, the participants exhibited the most positive attitudes in the social dimension, where Asoc (social attitude) had a mean of M = 4.83 , followed by Aenv (environmental attitude) with M = 4.69 ,and Aeco (economic attitude) with M = 4.70 (Marcos-Merino et al., 2020). In terms of sustainable behavior, the study showed lower engagement, particularly in the economic dimension, where Beco (economic behavior) had the lowest mean of M = 3.01 compared to Bsoc (social behavior) with M = 3.98 and Benv (environmental behavior) with M = 3.88 (Marcos-Merino et al., 2020). The study also revealed gender differences in sustainable behaviors, particularly in the economic dimension, male pre-service teachers reported higher economic behaviors with statistically significant differences (Marcos-Merino et al., 2020).. However, there were no significant gender differences in sustainabile attitudes or knowingness (Marcos-Merino et al., 2020).These findings suggest that while male pre-service teachers exhibited more sustainable economic behaviors, both genders shared comparable levels of sustainable knowingness and attitudes, particularly in the social dimension (Marcos-Merino et al., 2020).

Nousheen and Kalsoom (2022) explored the impact of different sustainability pedagogies on pre-service teachers' sustainability consciousness (SC) in an online

learning environment during the COVID-19 pandemic. The study used a mixed-method approach, with 49 pre-service teachers divided into experimental and control groups. The experimental group was exposed to sustainability pedagogies like case studies, critical incidents, group discussions, debates, and problem-based learning, while the control group received traditional lecture-based teaching in an online setting (Nousheen & Kalsoom, 2022). The study revealed significant improvements in SC in the experimental group after the intervention, specifically, the experimental group showed increased mean scores in the overall SC from M = 3.20 (pre-test) to M = 4.07 (post-test), with a significant difference (Nousheen & Kalsoom, 2022). The control group also showed an increase in sustainability consciousness, but the change was less pronounced, with mean scores rising from M = 3.16 (pre-test) to M = 3.64 (post-test) (Nousheen & Kalsoom, 2022). The results suggest that the sustainability pedagogies used in the experimental group significantly enhanced their knowingness, attitudes, and behaviors towards sustainability (Nousheen & Kalsoom, 2022). Pre-service teachers reported that activities like group discussions and case studies were particularly effective in broadening their understanding of sustainability issues(Nousheen & Kalsoom, 2022). Moreover, the qualitative data from interviews with participants indicated that the course content and the pedagogical approaches helped shape more sustainable behaviors (Nousheen & Kalsoom, 2022). The results highlight the importance of using constructivist, student-centered pedagogies to engage learners and facilitate the development of sustainability consciousness across various dimensions, including knowingness, attitude, and behavior (Nousheen & Kalsoom, 2022).

Chen et al. (2022) aimed to assess the sustainability literacy of 2,548 students students from various universities across China, focusing on sustainability knowingness, attitudes, and behaviors, The results revealed that sustainable knowingness scores were highest in the social dimension, followed by environmental knowingness and economic knowingness (Chen et al., 2022). In terms of sustainable attitudes, students exhibited positive attitudes across all dimensions, with social attitudes being the most favorable (Chen et al., 2022). Sustainable behavior was

comparatively lower, with social behavior having the highest mean (Chen et al., 2022). Regarding gender differences, male students demonstrated significantly higher levels of economic knowledge compared to female students, however, female students exhibited more positive attitudes toward environmental and social sustainability, with significantly higher scores in Aenv and Asoc compared to male students statistically significant (Chen et al., 2022). Moreover, significant gender differences were found in sustainable behaviors. The study concluded that while female students tended to have more positive attitudes toward sustainability, male students demonstrated higher economic knowingness, but overall sustainability behaviors were similar across genders (Chen et al., 2022).

Farliana, Hardianto, Rusdarti, and Sakitri (2023) explored the relationships between sustainable knowingness, attitudes, behaviors, and the moderating role of locus of control. The study applied the Theory of Planned Behavior (TPB) as a theoretical framework. The model hypothesized that sustainable knowingness would positively influence sustainable behavior and sustainable attitude would similarly influence behavior, furthermore, the study explored how locus of control affects sustainable knowingness, attitudes and behaviors (Farliana et al., 2023).. The study's findings revealed that sustainable knowingness had a significant positive influence on sustainability behavior. Similarly, sustainable attitude was found to significantly impact sustainability behavior (Farliana et al., 2023). The locus of control variable also played a significant role, affecting both sustainable knowingness and sustainable attitude, however, locus of control did not directly influence sustainable behavior (Farliana et al., 2023). The study also found that locus of control moderated the relationship between sustainable knowingness and sustainable behavior (Farliana et al., 2023). The model explained 71% of the variance in sustainable behavior (R^2 = 0.71) (Farliana et al., 2023). The results suggest that increasing sustainable knowingness, fostering positive attitudes, and promoting a sense of control over sustainable behaviors among university students (Farliana et al., 2023). These findings underscore the application of the Theory of Planned Behavior in

understanding how knowingness, attitudes, and perceived control shape SC in higher education (Farliana et al., 2023).

Another study was conducted among 489 participants with various demographic backgrounds, including differences in gender, age, occupation, income levels, and prior exposure to the concept of SD in Turkey (Yakışık & Mustafazade, 2023). The analysis revealed that SC significantly differed between male and female participants, specifically, male participants showed higher levels of SC, with a mean score of 4.06 compared to female participants (M=3.85) (Yakışık & Mustafazade, 2023). The findings revealed that SC varied across different demographic characteristics such as gender, age, occupation, income level. On the other hand, factors like educational status, place of upbringing, marital status, and the current educational institution were not found to be significant differentiators in SC. (Yakışık & Mustafazade, 2023)

Chukwu et al. (2024) investigated the SC of 147 university students from various academic levels by using SCQ in Nigeria. The findings showed that students demonstrated significant sustainable knowingness. The study also found higher sustainable attitude. students demonstrated significant sustainable behavior (Chukwu et al., 2024). Additionally, the study compared the sustainability consciousness of final-year students with those in earlier academic stages. Final-year students showed a higher SC compared to students in other years, with significant differences found in attitudes and behaviors (Chukwu et al., 2024).

Nousheen and Tabassum (2024) investigate the relationship between students' SC and the perceived teaching styles of their instructors. Researchers used SCQ and Grasha's (1996) Teaching Styles Inventory which classifies teaching styles into five categories: expert, formal authority, personal model, facilitator, and delegator (Nousheen & Tabassum, 2024). The study's findings revealed that students' Ksoc was highest, followed by Kenv, and Keco (Nousheen & Tabassum, 2024). When it came to sustainability attitudes, students scored highest on Aenv, followed by Asoc, and Aeco. However, students' scores on sustainable behavior were much lower, with

Benv scoring the lowest, followed by Bsoc and Beco (Nousheen & Tabassum, 2024). The overall SC score was M = 3.36, indicating that students in the Pakistani context exhibited moderate levels of SC (Nousheen & Tabassum, 2024). The study also found that the most prevalent teaching styles were expert (M = 4.19) and formal authority (M = 3.48) (Nousheen & Tabassum, 2024). These teacher-centered approaches were shown to significantly influence students' knowingness and attitudes but had no significant effect on their behavior. In contrast, the delegator teaching style affected all three dimensions of SC (Nousheen & Tabassum, 2024). The study's findings suggest that while teacher-centered approaches may effectively impart knowingness, but more interactive and student-centered approaches are necessary to drive attitudinal and behavioral change in ESD (Nousheen & Tabassum, 2024).

Mohamed et al. (2024) conducted a study to assess sustainability consciousness (SC) among nursing students at three Egyptian universities: Sohag, Damanhour, and Alexandria. They used SCQ to measure students' knowingness, attitudes, and behaviors regarding environmental, social, and economic sustainability (Mohamed et al., 2024). The results showed that students from Sohag University demonstrated the highest levels of sustainability consciousness across all areas, specifically, the median scores for environmental knowledge (Kenv) were 23.0, social knowledge (Ksoc) 33.0, and economic knowledge (Keco) 16.0, resulting in an overall sustainability consciousness score of 195 (Mohamed et al., 2024). In contrast, students from Alexandria University had the lowest median scores for sustainability knowledge. When it came to sustainability attitudes, Sohag University students again scored the highest, with environmental attitudes (Aenc) at 16.0, social attitudes (Asoc) at 24.0, and economic attitudes (Aeco) at 16.0. The overall sustainability attitudes score for Sohag students was 56.0. In terms of sustainability behaviors, Sohag students also led with higher scores. (Mohamed et al., 2024). The median scores for environmental behavior (Benv) were 27.0, social behavior (Bsoc) 24.0, and economic behavior (Beco) 15.0, resulting in an overall sustainability behavior score of 65.0 (Mohamed et al., 2024). Moreover, research revealed that students from

rural areas, those with higher family incomes, and those familiar with the Sustainable Development Goals (SDGs) exhibited higher levels of SC (Mohamed et al., 2024). Regarding gender differences, female students generally scored higher in sustainability knowingness, attitudes, and behaviors compared to male students (Mohamed et al., 2024). However, these differences were not statistically significant, indicating that while female students tended to have higher scores, the gender differences were not meaningful in determining overall sustainability consciousness (Mohamed et al., 2024).

CHAPTER 3

METHODOLOGY

This chapter includes Design of the Study, Population and Sample, Data Collection Tools, Validity and Reliability for pilot and main study, Data Collection Procedure, Internal Validity, External validity, Data Analysis, Limitations of the Study. Assumptions of the Study and Ethics within the Study.

3.1 Design of the Study

Associational research methodologies as correlational research and causal comparative research was used in this study. Correlational research examines relationships between two or more variables without attempting to manipulate them (Fraenkel, Wallen & Hyun,2012). Causal-comparative research is a quantitative research design that investigates cause-and-effect relationships by comparing groups based on differences among variables such as gender, school type (Fraenkel et al. 2012)

3.2 Population and Sample

The target population of this study was all ninth-grade students in Turkey. Accessible population of this study was all ninth-grade state students currently studying in state schools the district of Şehitkamil in Gaziantep.

Convenience sampling method involves selecting individuals or units for a research study based on their easy accessibility and availability (Babbie, 2016). Convenience sampling method were used to select participants due to accessibility of the participant. Data collected from two different type of school which are Anatolian High School and Science High School.

3.2.1 Sample for Pilot Study

Data for the pilot study was collected from 193 ninth-grade students currently enrolled in two state Anatolian high schools located in the Şehitkamil district of Gaziantep, selected through the convenience sampling method. Table 3.1 shows the demographic information of participants which includes gender, age and school type.

Table 3.1 Demographic Characteristics of the Sample for Pilot Study

Variable	Category	f	%
Gender	male	111	57,5
	female	82	42,5
	Total	193	100,0
Age	13,00	4	2,1
	14,00	114	59,1
	15,00	73	37,8
	16,00	2	1,0
	Total	193	100,0
School Type	Anatolian High School	193	100,0
	Total	193	100,0

3.2.2 Sample for Main Study

Data for the main study was collected from 922 ninth-grade students currently enrolled in five different state Anatolian high schools and two state Science high

schools located in the Şehitkamil district of Gaziantep, selected through the convenience sampling method. Table 3.2 shows the demographic information of participants which includes gender, age and school type.

Table 3.2 Demographic Characteristics of the Sample for Main Study

Variable	Category	f	%
Gender	male	524	56,8
	female	398	43,2
	Total	922	100,0
Age	13,00	5	,5
	14,00	447	48,5
	15,00	449	48,7
	16,00	16	1,7
	Missing	5	,5
	Total	922	100,0
School Type	Anatolian High School	670	72,7
	Science High School	252	27,3
	Total	922	100,0

3.3 Variables

3.3.1 Exogenous Variable

Exogenous Variable of this study is sustainable knowingness.

3.3.2 Endogenous Variables

Endogenous Variables of this study are sustainable attitudes and sustainable behavior.

3.4 Data Collection Tools

In the current study data was collected with a Demographic Information Form, Sustainability Consciousness Questionnaire

3.4.1 Demographic Information Form

Demographic Information Form was used to collect demographic information from ninth grade students. The form consists of three questions about gender, age, and type of school students' enrolled.

3.4.2 Sustainability Consciousness Questionnaire

Michalos et al. (2012) created the Sustainability Consciousness Questionnaire (SCQ) to assess knowledge, attitude, and behavior. Gericke et al. (2019) revised it based on UNESCO subthemes (2006, 2015). SCQ can be used for people 15 years or old (Gericke et al., 2019, p.39). In 2019, Yüksel and Yıldız adapted SCQ into Turkish and used it to detect high school students' sustainability consciousness level. The scale has 50 items and three factors (Knowledge, Attitude, and Behavior). Each

factor has three subfactor: economic, social, and environmental. The scale is structured as a 5-point Likert scale with responses ranging from “strongly agree” to “strongly disagree”. Since there are seven negatively worded items in the scale (items 4, 23, 33, 38, 41), their coding has been reversed. Items of factors and subfactors have given in the Table 3.3 below. Based on reliability and validity issues, some items were removed from the scale

Table 3.3 Factors, Subfactors and Item Numbers of SCQ

Factors	subfactors	item
Knowledge	economic	1, 11, 14, 15, 17
	social	2, 5, 6, 7, 8, 9, 10, 13, 18
	environmental	3, 4, 12, 16, 19
Attitude	economic	22, 25, 26, 31
	social	20, 21, 28, 29, 30, 32
	environmental	23, 24, 27, 33
Behaviour	economic	39, 42, 44, 49
	social	37, 38, 46, 47, 48, 50
	environmental	34, 35, 36, 40, 41, 43, 45

Based on reliability and validity issues, some items were removed from the scale (discussed in detail validity and reliability section). Last version of the scale given in the Table 3.4.

Table 3.4 Items which were used in main study.

Factors	subfactors	item
Knowledge	economic	11, 14, 15
	social	5, 6, 7, 8, 9, 10, 13
	environmental	12, 16, 19
Attitude	economic	22, 25, 26, 31
	social	20, 21, 28, 29, 30, 32
	environmental	23, 33
Behaviour	economic	39, 44
	social	37, 47
	environmental	34, 35, 36, 40, 43, 45

3.4.3 Validity and Reliability for Pilot Study

A pilot study was conducted to assess the suitability of each questionnaire and to allow for necessary corrections and revisions based on reliability and validty findings. To address reliability concerns before Cronbach's alpha of overall scale and subscale were calculated. To address validity, exploratory factor analysis was conducted.

Before Cronbach's alpha of overall scale and subscale were calculated, item total correlation for each item was calculated to ensure that each item on a test contributes effectively to the overall scale (Cohen, Swerdlik, & Sturman, 2018). Item-Total Correlation is a statistic which shows the correlation between each item in a scale and the total score of the scale (DeVellis, 2016). Moreover, it indicates how well the item aligns with the overall structure of the scale essentially measuring its discriminative power (Field, 2018). According to Nunnally and Bernstein (1994) , a high item-total correlation implies that the item contributes positively to the overall

purpose of the scale , while a low or negative correlation indicates that the item may be misaligned with the scale and could reduce its reliability. In item analysis, to improve the scale's coherence and reliability items with low correlations should be revised or removed (Nunnally & Bernstein, 1994). Removing or revising poorly correlated items at this stage increases internal consistency of the scale, ultimately leading to a more accurate Cronbach's alpha result, which measures the overall reliability of the test (Field, 2018). According to Ebel and Frisbie (1991) Items with a discrimination value of .40 or higher are considered very good and should be included in the scale without any modifications. Items with values between .30 and .39 are accepted quite good and can also be included but they might still benefit from some improvement (Ebel & Frisbie, 1991). Items with values between .20 and .29 may be included in the scale but should be revised or improved to enhance their quality (Ebel & Frisbie, 1991). Lastly, items with values of .19 or lower are considered too weak and should be excluded, as they do not significantly contribute to reliability of the scale (Ebel & Frisbie, 1991). Therefore, item total correlation for each item was calculated shown in the table below.

Table 3.5 Item-total correlation values

	Item-total correlation
q1*	0.10
q2	0.43
q3	0.41
q4*	0.14
q5	0.48
q6*	0.18
q7	0.42
q8	0.46
q9	0.56
q10	0.30
q11	0.44

Table 3.5 Item-total correlation values

	Item-total correlation
q12	0.52
q13	0.44
q14	0.60
q15	0.37
q16	0.48
q17	0.31
q18	0.46
q19	0.46
q20	0.63
q21	0.46
q22	0.45
q23	0.31
q24*	0.18
q25	0.41
q26	0.41
q27*	0.19
q28	0.54
q29	0.45
q30	0.41
q31	0.44
q32	0.43
q33	0.33
q34	0.30
q35	0.31
q36	0.36
q37	0.32
q38*	0.01
q39	0.38
q40	0.35
q41*	0.18
q42*	-0.09
q43	0.34

Table 3.5 Item-total correlation values

	Item-total correlation
q44	0.38
q45	0.52
q46	0.32
q47	0.35
q48	0.32
q49*	0.24
q50*	0.19

According to the table, Item 1 was removed from the scale since its item total correlation value is 0.10. This item could not be revised because Ebel and Frisbie (1991) states items with values of 0.19 or lower are considered too weak and should be excluded due to not significantly contributing to reliability of the scale. Similar result also has been seen in the study which is ‘’*Exploring the role of the economy in young adults' understanding of sustainable development''* conducted by Berglund and Gericke (2018). They state that ‘’some students are not aware of the multidimensional nature of the concept of SD. They may perceive SD as a strictly environmental concept. If so, they would not consider economic growth, economic development, and SD to relate theoretically’’ (Berglund & Gericke, 2018, p. 13).

Item 4 was removed from the scale since its item total correlation value is 0.14. This item is a reverse coded item, and reverse-coded items can sometimes present challenges, such as lower item discrimination (Wong, Rindfleisch, & Burroughs, 2003). However, this item could not be revised because Ebel and Frisbie (1991) states items with values of 0.19 or lower are considered too weak and should be excluded due to not significantly contributing to reliability of the scale.

Item 6 was removed from the scale since its item total correlation value is 0.18009. Waste refers to anything unnecessary or discarded, but in specialized fields, it includes specific categories like recyclable materials, hazardous waste, and

inefficiencies in lean manufacturing (Thürer, Tomašević, & Stevenson, 2017. This complexity may cause interpretative challenges in scales since respondents may perceive its meaning differently. However, this item could not be revised because Ebel and Frisbie (1991) states items with values of 0.19 or lower are considered too weak and should be excluded due to not significantly contributing to reliability of the scale.

Item 24 was removed from the scale since its item total correlation value is 0.18. The concept of laws and regulations can mean different things to different participants. Some may think that current environmental regulations are sufficient, while others may be concerned about the economic costs of stricter regulations. The term "stricter" can be unclear and can be interpreted differently by participants. Some may think of it as increasing penalties, while others may see it as enacting new laws and regulations. However, this item could not be revised because Ebel and Frisbie (1991) states items with values of 0.19 or lower are considered too weak and should be excluded due to not significantly contributing to reliability of the scale.

Item 27 was removed from the scale since its item total correlation value is 0.19. phrase "something is done," which can lead to different interpretations among participants. For example, some may think of individual actions (such as energy conservation), while others might think of government policies or international cooperation. However, this item could not be revised because Ebel and Frisbie (1991) states items with values of 0.19 or lower are considered too weak and should be excluded due to not significantly contributing to reliability of the scale.

Item 38 was removed from the scale since its item total correlation value is 0.01. This item is a reverse coded item, and reverse-coded items can sometimes present challenges, such as lower item discrimination (Wong et al., 2003). However, this item could not be revised because Ebel and Frisbie (1991) states items with values of 0.19 or lower are considered too weak and should be excluded due to not significantly contributing to reliability of the scale.

Item 41 was removed from the scale since its item total correlation value is 0.18. This item is a reverse coded item and reverse-coded items can sometimes present challenges, such as lower item discrimination (Wong, Rindfleisch, & Burroughs, 2003). However, this item could not be revised because Ebel and Frisbie (1991) states items with values of 0.19 or lower are considered too weak and should be excluded due to not significantly contributing to reliability of the scale.

Item 42 which is was removed from the scale since its item total correlation value is -0.09. In Turkey, the preference for second-hand products is generally low, often due to cultural factors, social stigma, and a preference for new products (Altay, 2021). This reason may cause that item total correlation value is too low. Item 42 removed from the scale since its item total correlation value is under 0.19 (Ebel & Frisbie, 1991).

Item 49 was removed from the scale. It could be revised for the main study since its item total correlation value is 0.24 however this sentence include two different statement as Following economy-related programs and Following newspaper articles. Making two different item such as "I watch economy-related TV programs" and "I read economy-related newspaper articles" can alter the structure of the scale and compromise the construct validity. Therefore item 49 was removed from the scale.

Item 50 was removed from the scale since its item total correlation value is 0.19. This study was conducted in Gaziantep which is a city where the patriarchal social structure is dominant (Özsoy & Sipahi, 2016). The lower item total correlation scores of the participants may be linked to traditional gender roles, which could have caused them to respond more reserved or cautious, especially when discussing gender sensitivity or personal opinions on social issues. Item 50 was removed from the scale without doing any revision since its item total correlation value is under 0.19 (Ebel & Frisbie, 1991).

After removing item 1, item 4, item 6, item 24, item 27, item 38, item 41 , item 42, item 49, and item 50 from the scale, Cronbach's alpha coefficients of the overall scale was calculated and found to be 0.89 for sustainability consciousness questionnaire. Cronbach's alpha coefficients of the Knowingness, Attitude and behaviour factors were found to 0.85, 0.78 and 0.78 respectively. Cronbach's alpha coefficients of the Knowingness economic (Keco) subfactor was calculated as 0.55, Knowingness social (Ksoc) subfactor was calculated as 0.73, Knowingness environmental (Kenv) subfactor was calculated as 0.62. Cronbach's alpha coefficients of the Attitude economic (Aeco) subfactor was calculated as 0.55, Attitude social (Asoc) subfactor was calculated as 0.72.

Generally, Cronbach's Alpha requires three or more items to provide meaningful results (Field, 2018). According to Tavakol and Dennick (2011), when only two items remain in a subscale, Cronbach's Alpha reliability coefficient is not feasible or do not provide reliable results. Therefore, subfactors with two items, Cronbach's alpha coefficients were not calculated. After removing item 24 and item 27, Attitude environmental (Aenv) subfactor remained with two items therefore Cronbach's alpha coefficient was not calculated. After removing item 42 and item 49, Behaviour economic (Beco) subfactor remained with two items therefore Cronbach's alpha coefficient was not calculated. Cronbach's alpha coefficient of Behaviour social (Bsoc) subfactor was calculated as 0.56, Behaviour environmental (Benv) subfactor was calculated as 0.70. Generally, Cronbach Alpha value is .70 or greater accepted as reliable (eg. Nunnally, 1978; Field, A., 2018). However, Kline (1999) states that Cronbach's Alpha values between 0.60 and 0.70 are regarded as minimally acceptable. Except for Keco, Beco, Bsoc, all factors, subfactors and overall Cronbach's Alpha values are greater than .60 which are acceptable value. Berglund and Gericke (2015) states that '' The Cronbach's Alpha value also depends on the number of items reflecting the construct: increasing the number of items for a construct generally increases its Cronbach's Alpha value'' (p.1124). Moreover, Berglund and Gericke (2018) have found low Cronbach's Alpha value (.58) for some

subdimensions of SCQ and they state that SCQ are composed of numerous few items and this explains why some subfactors have low Cronbach's Alpha value.

Table 3.6 Cronbach's Alpha Values of SCQ for Pilot Study

Factors	subfactors	Cronbach's alpha value
	economic	0.55
Knowingness	social	0.73
	environmental	0.62
	overall	0.85
	economic	0.55
Attitude	social	0.72
	overall	0.78
Behaviour	social	0.56
	environmental	0.70
	overall	0.78
Overall		0.89

To evaluate the construct validity of the sustainability consciousness questionnaire, exploratory factor analysis was employed to examine the factor structure. To ensure the conditions for factorability in the current research, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity were applied to the pilot study. The Bartlett's test of sphericity yielded a significant result ($p = .000$), and the KMO value was calculated to be .82 , which is considered acceptable. Moreover, Varimax

rotation was applied, and factors explained 64.51% of the total variance. As a result of the exploratory factor analysis, the Knowingness subscale explained 60,44% of the total variance, the Attitude subscale explained 52,62% of the total variance, behaviour subscale explained 59,02% of the total variance respectively. It is sufficient that 40%–60% of the variance explained in multiple factorial scales (Hair et al., 2010). The total variance values are consistent with those found by Yüksel and Yıldız (2019), who adapted the scale into Turkish. According to their study, the Knowingness subscale explained 62.43% of the total variance, the Attitude subscale explained 59.49% of the total variance, behaviour subscale explained 60.76% of the total variance respectively. Matsunaga (2010) states that factor loading of items with .40 or greater are acceptable for EFA. EFA have shown that all items had factor loading score more than 0.40.

3.4.4 Validity for Main Study: CFA Result of Sustainability Consciousness Questionnaire

Confirmatory Factor Analysis (CFA) is a statistical technique used to verify the factor structure of a set of observed variables to examine construct validation (Harrington, 2009; Brown & Moore, 2012). Mplus 7.4 was used to conduct Confirmatory Factor Analysis to test construct validity for Sustainability consciousness questionnaire for the main study.

McNeish, An, and Hancock (2017) viewed factor loading of items .40 or greater as acceptable for CFA. Based on CFA items 2, item 3, item 17, item 18, item 46 and item 48 were removed from the scale since loading are smaller than .40 (McNeish, An, & Hancock, 2017). Items that are removed from the scale have not been examined to go under other constructs since authors state that ‘’the model that was built through theory and intended to show the factor structure as hypothesized’’ (Gericke et al., 2019, p.42).

Several model fit indices were used to assess goodness of fit of the CFA indicating the validity of the factor structure, such as CFI, TLI, RMSEA, and SRMR . The CFI and TLI values are greater than 0.90, whilst the RMSEA and SRMR values are less than

0.08, which indicates that the model has an acceptable level (Kline, 2012). Sümer (2000) suggested that the value of $\chi 2/df$ is between 2 and 3. However, Erkorkmaz et al. (2013) suggested value less than 5 is acceptable. The results of the model fit indices obtained from CFA indicated that the model acceptable fit the data for this sample ($\chi 2/df = 2.16$, CFI = .91, TLI=.90, RMSEA = .04, SRMR = .04). Figure 1 presents an illustration of the CFA model for the sustainability consciousness questionnaire.

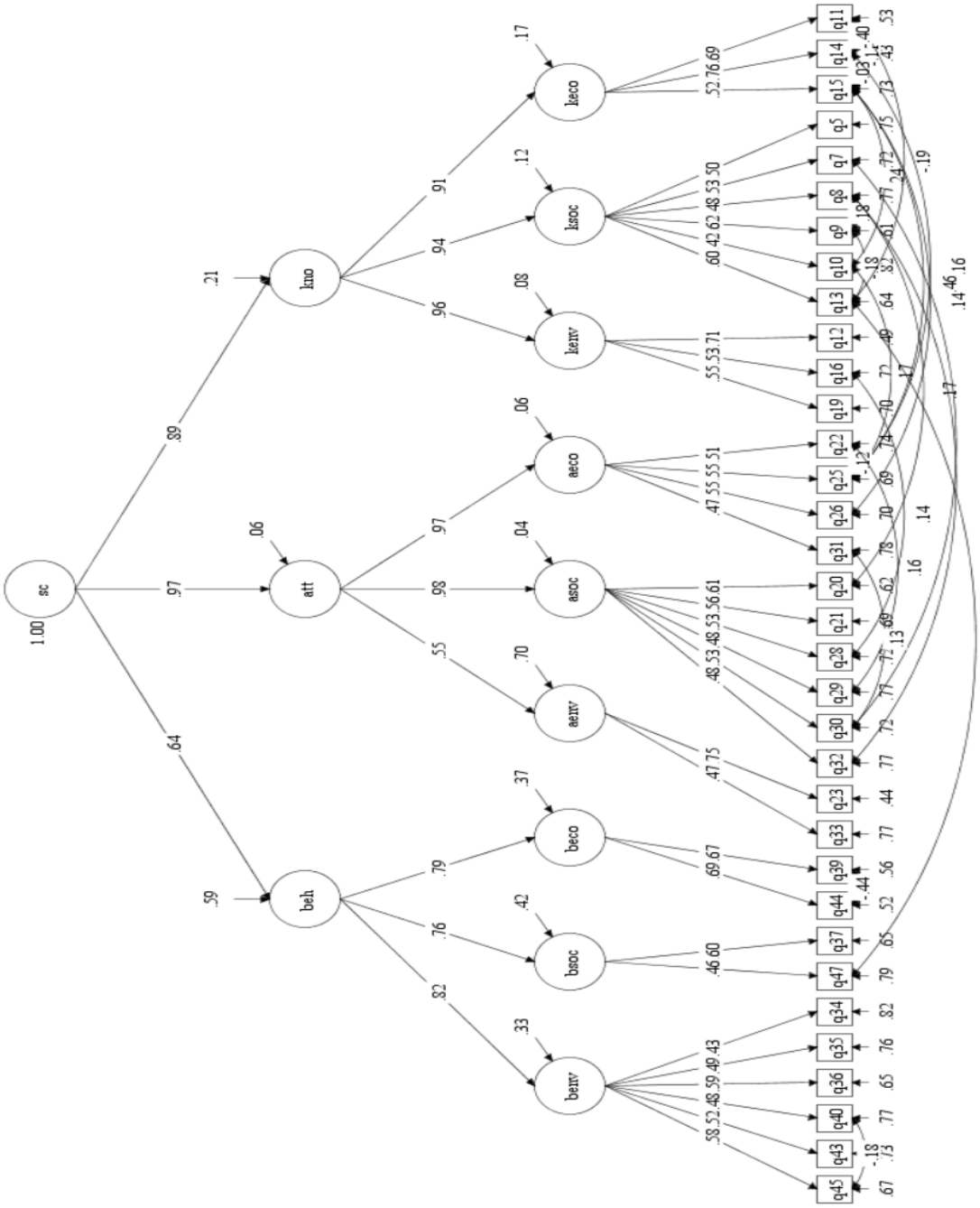

Figure 3.1 CFA Model for SCQ

As shown in Figure, the error covariances between the variables were added to the model because the model presented a good-fit to the data with the acceptable fit indices applying the modification index (MI). Modification indices are a valuable resource for

identifying model misspecifications (Kline, 2012). So, two correlated-error terms had modification index greater than 10 ($p < 0.05$): q15 – q25, q11 – q14, q8 – q32, q14 – q15, q16 – q28, q7 – q30, q22 – q25, q14 – q25, q10 – q15, q39 – q44, q15 – q26, q10 – q25, q11 – q15, q14 – q25, q22 – q29, q40 – q45, q8 – q20, q11 – q13, q13 – q47, q30 – q31, q9 – q13, and q8 – q9. As shown in the figure, generally, similar subdimensions are interconnected among themselves.

3.4.5 Reliability for Main Study

Reliability is crucial in ensuring the dependability of research findings, as it reflects the consistency and stability of the measurement tool (Creswell, 2014). For sustainability consciousness questionnaire, Cronbach's alpha values have been calculated. Cronbach's Alpha requires three or more items to provide meaningful results (Field, 2018). According to Tavakol and Dennick (2011), when only two items remain in a subscale, Cronbach's Alpha reliability coefficient is not feasible or do not provide reliable results. Therefore, subfactors with two items, Cronbach's alpha coefficients were not calculated. After removing item 46 and item 48 based on CFA, Bsoc subfactor remained with two items therefore Cronbach's Alpha was not calculated. Overall, Bsoc, Aenv and Beco subfactors remained with two items therefore Cronbach's Alpha were not calculated. other subfactors and overall Cronbach's Alpha values are 0.60 and greater which are acceptable value (Kline,1999).

Table 3.7 Cronbach's Alpha Values of SCQ for Main Study

Factors	subfactors	Cronbach's alpha value
Knowledge	economic	0.61
	social	0.73
	environmental	0.60
	overall	0.84
Attitude	economic	0.60
	social	0.72
	overall	0.80
	environmental	0.71
Behaviour	overall	0.77
Overall		0.89

3.5 Internal Validity

Internal validity refers that "observed differences on the dependent variable are directly related to the independent variable, and not due to some other unintended variable" (Fraenkel, Wallen & Hyun, 2012, p. 166). The study employed associational research methodologies, including correlational and causal-comparative research, thus only the threats which is mentioned below can be threat for this study.

In current study, subject characteristics might be threat for internal validity. According to Fraenkel et al, (2012) participants' age, ethnicity, gender might affect the outcomes of the research. Only ninth grade Turkish students participated to this study so age and ethnicity cannot be threat. Moreover, results were analysed in terms of gender.

Location also can be a threat for current study since data will be collected in different high schools and location could not be hold constant (Fraenkel et al, 2012). However, all participants responded the instruments from the similar classes by sitting at their desks. Thus, we can assume that participants respond the questions to similar environments and conditions.

All data were collected by the same person which is researcher thus data collector characteristics cannot be threat for this study (Fraenkel et al, 2012).

History threat cannot be threat for this study because during the data collection process an unforeseen or unplanned event did not occur (Fraenkel et al, 2012).

3.6 External Validity

External validity refers to the extent to which a study's findings and conclusions can be extrapolated to a larger population than the participants in the study (Fraenkel et al, 2012). Convenience sampling involves a convenient selection of participants, which limits the study's generalizability to a larger population. (Fraenkel et al, 2012). It is critical for generalizability to provide the generalizability of the population by using a representative sample. The convenience sampling approach, however, were utilized to select participants of study. Therefore, the findings of this study may only be generalizable to other groups with similar characteristics to the current sample.

3.7 Data Collection Procedure

3.7.1 Pilot Study

Data for pilot study were collected of the second term of 2023-2024 academic year from 193 ninth grade students. The consent form was distributed to both students and parents. Only students whose permission form was approved by their families and students who volunteered participated in the study. Data collector informed the participants about the purpose of the study before she disturbed the instruments and stated both verbally and then written that this study is being conducted on a volunteer basis and participants may withdraw from the study at any time.

3.7.2 Main Study

After the results of pilot study, it was shown that instruments are valid and reliable. Therefore, without doing any changing, instruments were used in main study. For

main study, data were collected of the second term of 2023-2024 academic year. The consent form was distributed to both students and parents. Only students whose permission form was approved by their families and students who volunteered participated in the study. Data collector informed the participants about the purpose of the study before she disturbed the instruments and stated both verbally and then written that this study is being conducted on a volunteer basis and participants may withdraw from the study at any time.

3.8 Data Analysis

The data acquired from the scales filled out by the students were used in the current study. To analyse the current data, the SPSS 25.0 and Mplus 7.4 statistical program performed both descriptive and inferential statistical analyses, including Path Analysis.

3.9 Limitations of the Study

Limitations of this study are:

1. Present study conducted with to 7 state high schools from Şehitkamil District of Gaziantep. Therefore, the results of this study may not be generalizable to the broader population
2. Generalizability might be limitation of this study since selection of sample is convenience sampling method. Thus, findings of the study only be generalized to other ninth grade students with similar characteristics to the present sample.

3.10 Assumptions of the Study

Assumptions of this study are:

1. All respondents responded to the instruments honestly and seriously.
2. The study sample were considered a representation of the actual population.
3. It is assumed that all participants responded to the instruments under standard conditions and in similar environments.

3.11 Ethics within the Study

Permissions were obtained by adapters of Turkish version of Sustainability Consciousness Questionnaire (Yüksel & Yıldız, 2019) via e-mail. Then, to conduct this research received an approval from the METU's Human Subjects Ethics Committee (Appendices C). Since the participants of this study were ninth grade high school students received approval from the Ministry of National Education (Appendices D). Both parents and pupils signed the consent form. All ninth-grade students took part in the stud on a voluntary basis.

CHAPTER 4

RESULTS

4.1 Missing Data

Firstly, Little's MCAR test was applied to each scale to determine if the data were missing completely at random (Little, 1988). The significance values, which were greater than 0.05, suggest that the missing values were distributed randomly. However, in this study, significance values of each scale, gender, age and school type are less than 0.05. Tabachnick and Fidell (2013) noted that in a large data set, if 5% or fewer data points are randomly missing, the issues are less significant, and nearly all methods for handling missing data produce comparable outcomes. Therefore, missing values of each scale and age variable were replaced with the series mean of the items. However, gender and school type are categoric variables, they replaced with the mode since the common method for filling missing data in categorical variables is to impute the missing values with the mode, which is the most frequently occurring category (Acock, 2005).

4.2 Descriptive Statistics

In this section, frequencies, mean scores, and standard deviation of each scale were represented. Descriptive statistics were used to address the first research question.

4.2.1 Sustainability Consciousness levels of high school students

Research Question 1: What are the Sustainability Consciousness levels of high school students?

Table 4.1 Descriptive Statistics for SC and Associated Variables (n=922)

	Mean	Median	SD	Minimum	Maximum
Knowingness	4.40	4.50	0.54	1.25	5.00
Kenv	4.51	4.67	0.57	1.67	5.00
Ksoc	4.35	4.50	0.63	1.00	5.00
Keco	4.37	4.67	0.67	1.00	5.00
Behaviour	3.47	3.50	0.66	1.10	5.00
Benv	3.31	3.33	0.72	1.00	5.00
Bsoc	3.85	4.00	1.04	1.00	5.00
Beco	3.56	3.50	0.93	1.00	5.00
Attitude	4.29	4.42	0.55	1.58	5.00
Aenv	4.44	5.00	0.82	1.00	5.00
Asoc	4.29	4.33	0.63	1.50	5.00
Aeco	4.21	4.25	0.66	1.75	5.00
SC	4.09	4.15	0.48	1.59	5.00

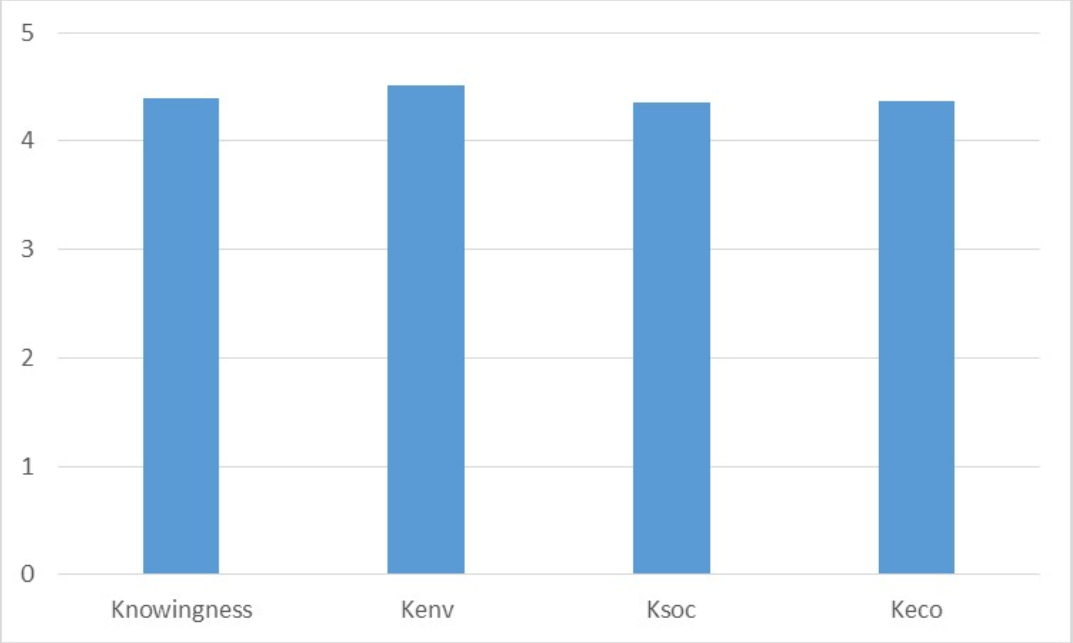

Figure 4.1 Mean Scores of Sustainable Knowingness and its subdimensions

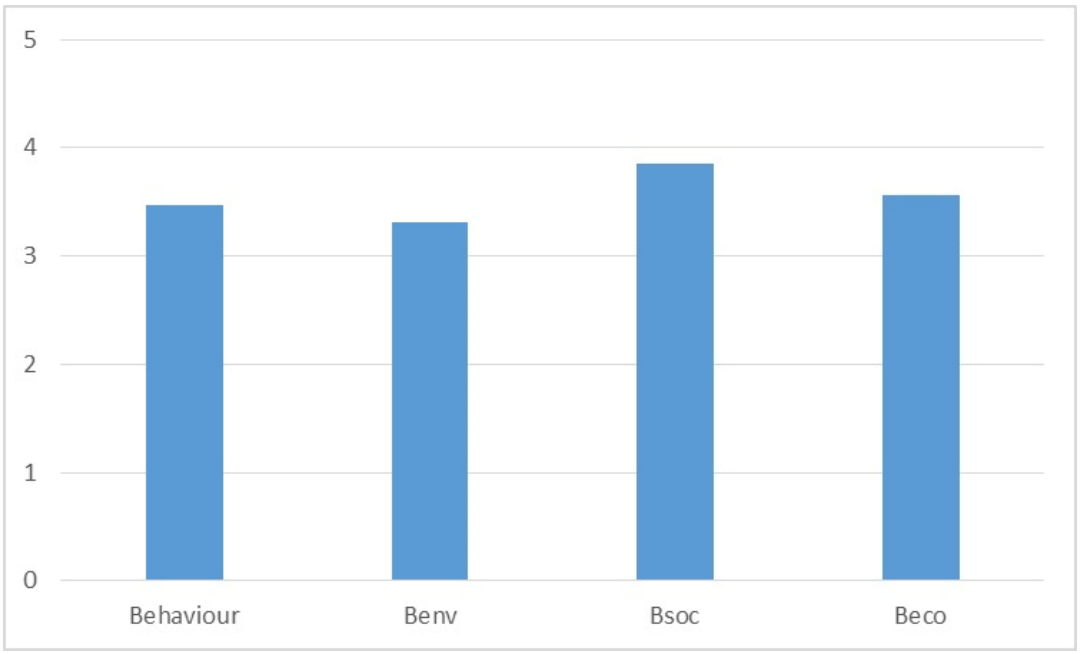

Figure 4.2 Mean Scores of Sustainable Behaviour and its subdimensions

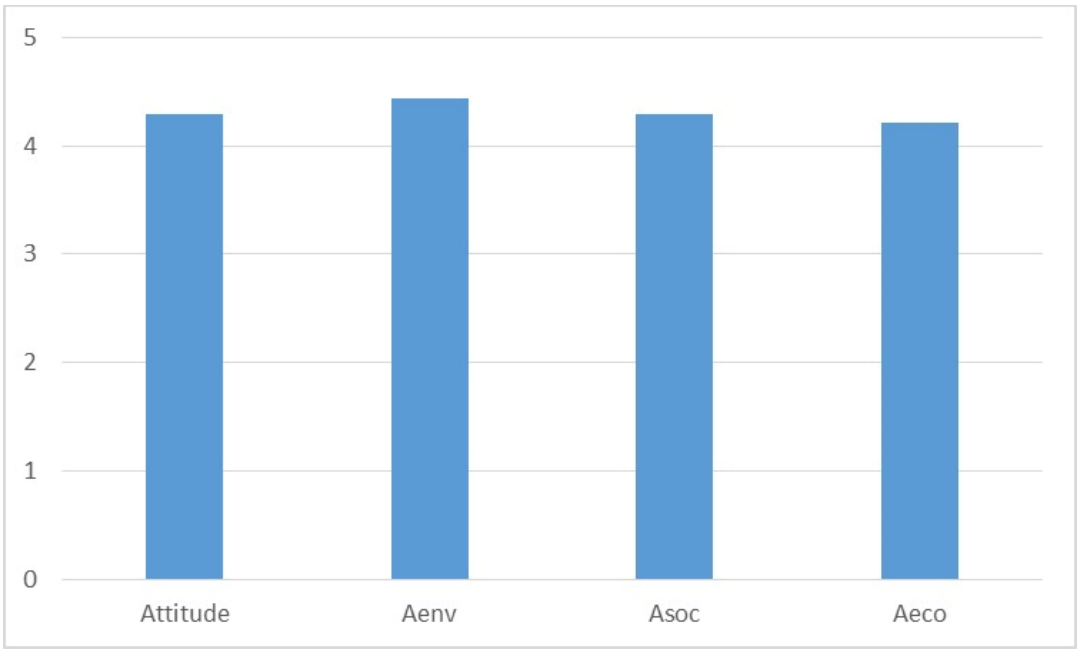

Figure 4.3 Mean Scores of Sustainable Attitude and its subdimensions

Descriptive statistics were calculated for the variables in the study, and the results are presented in terms of means, medians, standard deviations (SD), and ranges (minimum and maximum values). Participants' overall Sustainable Knowingness was found Md = 4.50, M = 4.40, SD = 0.54. Among the sub-dimensions, environmental knowingness (Kenv: M = 4.51, Md = 4.67, SD = 0.57) had the highest mean, followed by economic knowingness (Keco: M = 4.37, Md = 4.67, SD = 0.67) and social knowingness (Ksoc: M = 4.35, Md = 4.50, SD = 0.63). In terms of behavior, overall Behavior was found Md = 3.50, M = 3.47, SD = 0.66. Environmental Behavior (Benv: M = 3.31, Md = 3.33, SD = 0.72) had the lowest mean, followed by Economic Behavior (Beco: M = 3.56, Md = 3.50, SD = 0.93) while social Behavior (Bsoc: M = 3.85, Md = 4.00, SD = 1.04) showed the highest mean. Moreover, Participants' overall Sustainable Attitude was found M = 4.29, Md = 4.42, SD = 0.55), with environmental attitude (Aenv: M = 4.44, Md = 5.00, SD = 0.82) having the highest mean followed by Social Attitude (Asoc: M = 4.29, Md = 4.33, SD = 0.63) while economic Attitude (Aeco: M = 4.21, Md = 4.25, SD = 0.66) had the lowest mean, Finally, participants' Sustainability Consciousness (SC) level was found M = 4.09 ,Md = 4.15, SD = 0.48. The sample size for all variables was 922.

4.3 Inferential Statistics

4.3.1 Gender Difference in Sustainability Consciousness

Research Question 2: Is there a statistically significant difference in Sustainability Consciousness level with respect to gender (male, female)?

To decide whether to use a parametric or non-parametric test for a research question, the following assumptions were checked. Independent samples t-test is used when comparing the means of two independent groups to determine if there is a statistically significant difference between them (Field, 2013). Initially, assumptions were checked.

Assumptions

Independence of observation : It was assumed that each group is independent

Normality**:** To check normality skewness and Kurtosis values were calculated. Table… shows that skewness and kurtosis values were admissible which were between -2 and +2 interval (Gravetter & Wallnau, 2014). According to the table, except for knowingness, Ksoc and Aenv the skewness and kurtosis values of the others are between -2 and +2, that's why for knowingness, Ksoc and Aenv, the Mann-Whitney U test were applied which is a non-parametric test.

Table 4.2 the skewness and kurtosis values of SCQ

	Skewness		Kurtosis	
	Skewness	SE	Kurtosis	SE
Knowingness	-1.4710	0.0805	3.09366	0.161
Kenv	-1.3401	0.0805	1.88523	0.161
Ksoc	-1.5257	0.0805	3.10150	0.161
Keco	-1.2938	0.0805	1.79652	0.161
Behaviour	-0.2110	0.0805	0.10371	0.161
Benv	-0.0246	0.0805	-0.03241	0.161
Bsoc	-0.8776	0.0805	0.21426	0.161
Beco	-0.4662	0.0805	0.00365	0.161
Attitude	-1.0598	0.0805	1.19331	0.161
Aenv	-1.7982	0.0805	3.27640	0.161
Asoc	-1.1194	0.0805	1.26380	0.161
Aeco	-0.9776	0.0805	0.94406	0.161
SC	-0.9743	0.0805	1.45630	0.161

Level of Measurement: It was assumed that Sustainability Consciousness level was continuous.

Homogeneity of Variances:

Table 4.3 Homogeneity of Variances Test (Levene's)

	F	df	df2	p
Knowingness	35.47	1	920	< 0.01
Kenv	27.07	1	920	< 0.01
Ksoc	41.01	1	920	< 0.01
Keco	34.13	1	920	< 0.01
Behaviour	23.88	1	920	< 0.01
Benv	8.98	1	920	< 0.01
Bsoc	26.97	1	920	< 0.01
Beco	16.74	1	920	< 0.01
Attitude	27.42	1	920	< 0.01
Aenv	38.45	1	920	< 0.01
Asoc	32.41	1	920	< 0.01
Aeco	21.40	1	920	< 0.01
SC	35.62	1	920	< 0.01

Note. A low p-value suggests a violation of the assumption of equal variances

According to Table 4.3, the homogeneity test for Knowingnes, Kenv, Ksoc, Keco, Behaviour, Benv, Bsoc, Beco, Attiitude, Aenv, Asoc, Aeco and SC was found to be

significant ($p < 0.05$), indicating that these distributions are not homogeneous. Therefore, the Mann-Whitney U test, a non-parametric test, was applied, and the results are shown in Table 4.4, Table 4.5, Table 4.6, Table 4.7 for each factor and subfactors.

Table 4.4 Mean, Median and the Mann-Whitney U test scores of Sustainable Knowingness and its subdimensions

Variable	Group	N	Mean	Median	SD	Mann-Whitney U	Cohen's d
Knowingness	Male	524	4.52	4.58	0.44	73984**	0.29
	Female	398	4.25	4.33	0.61		
Kenv	Male	524	4.44	4.67	0.50	87679**	0.16
	Female	398	4.14	4.67	0.64		
Ksoc	Male	524	3.40	4.67	0.52	72216**	0.31
	Female	398	3.24	4.33	0.71		
Keco	Male	524	4.14	4.67	0.56	84277**	0.19
	Female	398	3.89	4.33	0.77		

Note. * $p < 0.05$, ** $p < 0.01$

Mann-Whitney U tests were conducted to compare median scores between male and female participants for Knowingness, Kenv, Ksoc, and Keco. For Knowingness, males (Md = 4.58, M = 4.52, SD = 0.44, N = 524) scored significantly higher than females (Md = 4.33, M = 4.25, SD = 0.61), U = 73984, df = 920, $p < 0.01$, with a small effect size (d = 0.29). For Kenv, males (Md = 4.67, M = 4.44, SD = 0.50, N = 524) also had higher scores than females (Md = 4.67, M = 4.14, SD = 0.64), U = 87679, df = 920, $p < 0.01$, with a small effect size (d = 0.16). For Ksoc, males (Md = 4.67, M = 3.40, SD = 0.52, N = 524) scored significantly higher than females (Md = 4.33, M = 3.24, SD = 0.71), U = 72216, df = 920, $p < 0.01$, with a small effect size (d = 0.31). Finally, in Keco, males (Md = 4.67, M = 4.14, SD = 0.56, N = 524) scored

significantly higher than females (Md = 4.33, M = 3.89, SD = 0.77), U = 84277, df = 920, $p < 0.01$, with a small to medium effect size (d = 0.19). These results indicate statistically significant differences in Knowingness, Kenv, Ksoc, and Keco scores between male and female groups, with males generally scoring higher than females in these variables.

Table 4.5 Mean, Median and the Mann-Whitney U test scores of Sustainable Behavior and its subdimensions

Variable	Group	N	Mean	Median	SD	Mann-Whitney U	Cohen's d
Behavior	Male	524	3.57	3.60	0.58	84014**	0.19
	Female	398	3.34	3.31	0.72		
Benv	Male	524	3.35	3.33	0.68	96956	0.07
	Female	398	3.27	3.17	0.76		
Bsoc	Male	524	4.10	4.00	0.91	71039**	0.32
	Female	398	3.51	3.50	1.11		
Beco	Male	524	3.71	3.89	0.82	84515**	0.19
	Female	398	3.36	3.50	1.02		

Note. * $p < 0.05$, ** $p < 0.01$

Mann-Whitney U tests were conducted to compare median scores between male and female participants for Behaviour, Benv, Bsoc, and Beco. For Behaviour, males (Md = 3.60, M = 3.57, SD = 0.58, N = 524) scored significantly higher than females (Md = 3.31, M = 3.34, SD = 0.72), U = 84014, df = 920, $p < 0.01$, with a small effect size (d = 0.19). For Benv, males (Md = 3.33, M = 3.35, SD = 0.68, N = 524) showed no significant difference compared to females (Md = 3.17, M = 3.27, SD = 0.76), U = 96956, df = 920, $p = 0.067$, with a very small effect size (d = 0.07). For Bsoc, males (Md = 4.00, M = 4.10, SD = 0.91, N = 524) scored significantly higher than females (Md = 3.50, M = 3.51, SD = 1.11), U = 71039, df = 920, $p < 0.01$, with a medium

effect size (d = 0.32). Finally, in Beco, males (Md = 3.89, M = 3.71, SD = 0.82, N = 524) scored significantly higher than females (Md = 3.50, M = 3.36, SD = 1.02), U = 84515, df = 920, p < 0.01, with a small to medium effect size (d = 0.19). These results indicate statistically significant differences in Behaviour, Bsoc, and Beco scores between male and female groups, with males generally scoring higher in these variables, while no significant gender differences were found for Benv.

Table 4.6 Mean, Median and the Mann-Whitney U test scores of Sustainable Attitude and its subdimensions

Variable	Group	N	Mean	Median	SD	Mann-Whitney U	Cohen's d
Attitude	Male	524	4.42	4.50	0.47	73173**	0.30
	Female	398	4.12	4.25	0.60		
Aenv	Male	524	4.56	5.00	0.73	86071**	0.17
	Female	398	4.28	4.50	0.91		
Asoc	Male	524	4.44	4.50	0.53	72414**	0.31
	Female	398	4.09	4.17	0.70		
Aeco	Male	524	4.31	4.27	0.59	86543**	0.17
	Female	398	4.09	4.25	0.73		

Note. * p < 0.05, ** p < 0.01

Mann-Whitney U tests were conducted to compare median scores between male and female participants for Attitude, Aenv, Asoc, and Aeco. For Attitude, males (Md = 4.50, M = 4.42, SD = 0.47, N = 524) scored significantly higher than females (Md = 4.25, M = 4.12, SD = 0.60), U = 73173, df = 920, p < 0.01, with a medium effect size (d = 0.30). For Aenv, males (Md = 5.00, M = 4.56, SD = 0.73, N = 524) also had significantly higher scores than females (Md = 4.50, M = 4.28, SD = 0.91), U = 86071, df = 920, p < 0.01, with a small effect size (d = 0.17). In Asoc, males (Md = 4.50, M = 4.44, SD = 0.53, N = 524) scored significantly higher than females (Md = 4.17, M = 4.09, SD = 0.70), U = 72414, df = 920, p < 0.01, with a medium effect size (d = 0.31). Finally, for Aeco, males (Md = 4.27, M = 4.31, SD = 0.59, N = 524)

scored significantly higher than females (Md = 4.25, M = 4.09, SD = 0.73), U = 86543, df = 920, p < 0.01, with a small effect size (d = 0.17). These results indicate statistically significant differences in Attitude, Aenv, Asoc, and Aeco scores between male and female groups, with males generally scoring higher in these variables.

Table 4.7 Mean, Median and the Mann-Whitney U test scores of Sustainability Consciousness

Variable	Group	N	Mean	Median	SD	Mann-Whitney U	Cohen's d
SC	Male	524	4.20	4.24	0.39	71654**	0.31
	Female	398	3.93	4.00	0.53		

Note. * p < 0.05, ** p < 0.01

Mann-Whitney U tests were conducted to compare median scores between male and female participants for Sustainability Consciousness (SC). For SC, males (Md = 4.24, M = 4.20, SD = 0.39, N = 524) scored significantly higher than females (Md = 4.00, M = 3.93, SD = 0.53), U = 71654, df = 920, p < 0.01, with a medium effect size (d = 0.31). These results indicate a statistically significant difference in SC scores between male and female groups, with males generally scoring higher in this variable

4.3.2 Result of Path Analysis: Predictors of Sustainable Behavior

Research Question 3: What is the relationship between sustainable behaviour, sustainable knowingness and sustainable attitude?

a) To what extent can students' sustainable behaviour level be predicted by sustainable knowingness and sustainable attitude level?

b) To what extent can students' sustainable attitude level be predicted by sustainable knowingness level?

Sarwono (2022) states that path analysis is an extension of multiple linear regression therefore before conducting path analysis assumptions of multiple linear regression are met. Assumptions of multiple linear regression were checked for the hypothesised model below before conducting path analysis. The hypothesized model was tested by using MPLUS 7.4.

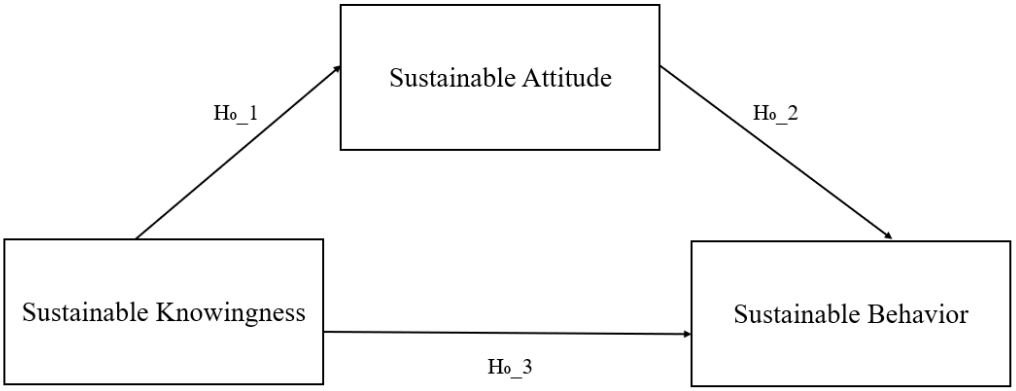

Figure 4.4 Hypothesised Model for Current Study

Assumptions;

Sample size: Tabachnick and Fidell (2013) stated that $N \geq 50 + 8m$ for multiple regression where m represents the number of independent variables. There are two independent variables which are sustainable knowingness and sustainable attitude so minimum sample size calculated as 66. Since this study were conducted with 922 ninth grade student, this assumption was met.

Multicollinearity and Singularity: To meet the multicollinearity assumption, Tabachnick and Fidell (2013) stated that bivariate correlation between two variables should be less than 0.90 ($r < 0.90$) . Moreover, VIF values should be less than 10 but higher than 0.10 (Pallant, 2011). According to table below, correlations between the variables are not higher than 0.90. VIF value also 2.10 with an acceptable value. Therefore, this assumption was met.

Table 4.8 Pearson product-moment correlations of variables in the model

		Knowingness	Attitude	Behaviour
Knowingness	Pearson's r	—		
Attitude	Pearson's r	0.72 **	—	
Behaviour	Pearson's r	0.39 **	0.43 **	—

Note. * $p < 0.05$, ** $p < 0.01$

Table 4.9 Collinearity Statistics

	VIF	Tolerance
Knowingness	2.10	0.47
Attitude	2.10	0.47

Normality, Linearity, Homoscedasticity of Residual; Normality was checked by examining histogram and P-P plot. As shown in Figure 4.2 , histogram of residuals and Figure 4.3 , P-P plot, this assumption was met due to normally distributed. Moreover, straight line in P-P plot shows that linearity assumption was also satisfied. Moreover, for Homoscedasticity Residual vs. Fitted Plot was checked shown in the figure. the residuals appear to be scattered randomly around the zero line without any clear pattern. Therefore, this assumption was also satisfied.

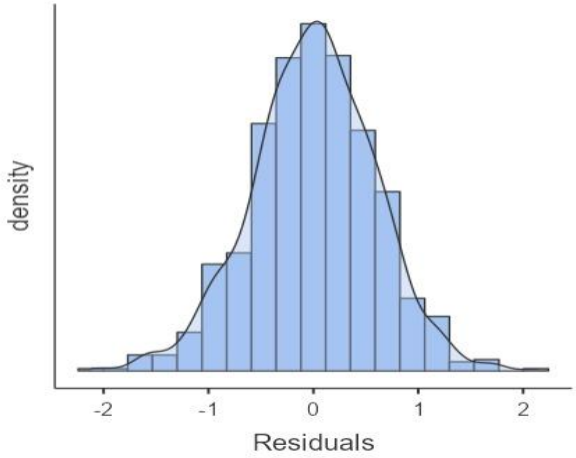

Figure 4.5 Histogram Graph

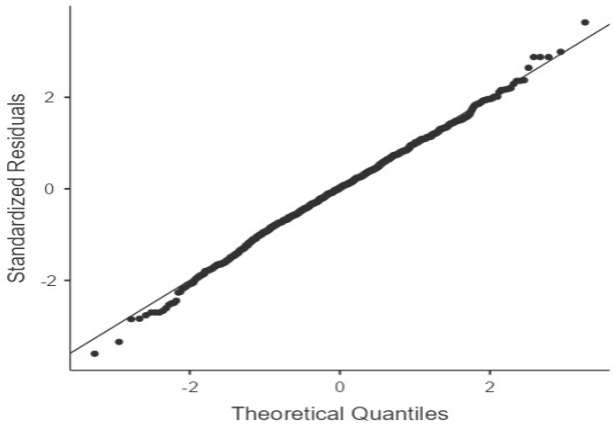

Figure 4.6 P-P Plot

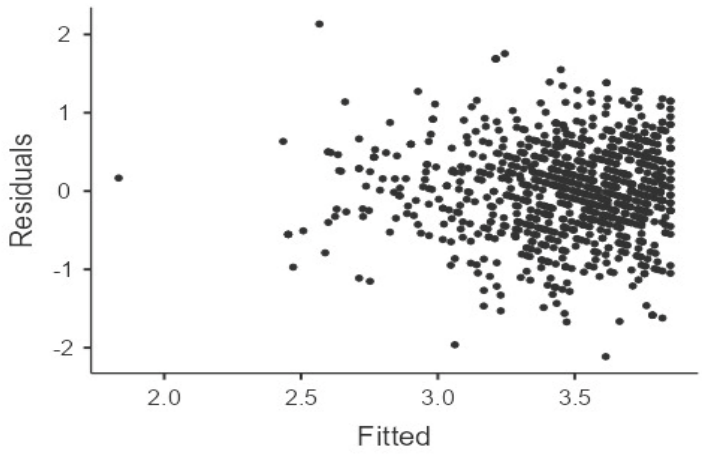

Figure 4.7 Homoscedasticity Residual vs. Fitted Plot

No Autocorrelation: The Durbin-Watson Test is used to detect autocorrelation in the residuals of a regression analysis . as in the table below, value is 1.96 indicates that this assumption was also satisfied.

Table 4.10 Durbin–Watson Test for Autocorrelation

Autocorrelation	DW Statistic	p
0.0197	1.96	0.552

After checking all the assumptions, path analysis was conducted.

4.3.2.1 Model Fit Information of Hypothesized Model

Model fit indices of hypothesized models were examined to detect if the models fit the data or not.

$\chi 2$/df value between 1 and 3 is generally considered to indicate a good fit (Kline, 2012). Moreover, the CFI and TLI values are greater than 0.90, whilst the RMSEA and SRMR values are less than 0.08, which indicates that the model has an acceptable level (Kline, 2012). The model fit indices suggest a good fit for the path analysis model: $\chi 2(497) = 1069.441$, $p< 0.01$; $\chi 2/df=2.15$; RMSEA = 0.039, 90% CI [0.036, 0.042], The RMSEA 90% confidence interval ranges from 0.036 to 0.042. RMSEA values are typically considered good if they are 0.05 or lower (Browne & Cudeck, 1993). Therefore, the estimated RMSEA value of 0.039 and its confidence interval suggest that the model demonstrates a good fit. Probability RMSEA ≤ 0.05 = 1.000; CFI = 0.90; TLI = 0.90; SRMR = 0.05. These results indicate that the model fits the data well.

4.3.2.2 Results of Direct, Indirect, and Total Effects of hypothesized model

Cohen's criteria is used when interpreting path coefficients (Cohen, 1988). Cohen (1988) states that standardized path coefficient (β) value less than 0.10 may indicate small effect; 0.30 indicates medium effect and values higher than 0.50 indicate large effect.

Table 4.11 Direct, indirect and total path coefficients for Hypothesised Model

	SA			SB		
	Direct	Indirect	Total	Direct	Indirect	Total
SK	0.88	-	0.88	-0.06	0.61	0.55
SA	-	-	-	0.69	-	0.69

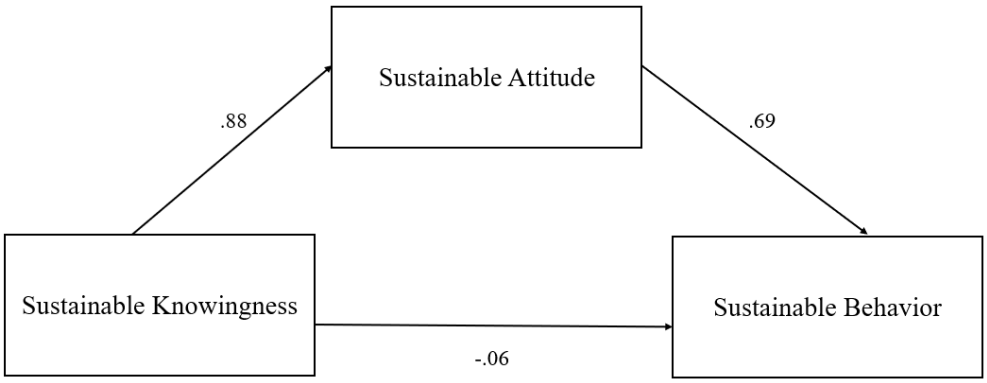

Figure 4.8 Path Coefficients of Hypothesised Model

4.3.2.2.1 Direct Effects

- H_o_1: There is no significant effect of Sustainable Knowingness on Sustainable Behavior .

Analysis indicates $\beta = -0.06$, $p = 0.07$. H_o_1 was not rejected. This suggests that the effect of Sustainable Knowingness on Sustainable Behavior is not statistically significant.

- H_o_2 : There is no significant effect of Sustainable Knowingness on Sustainable Attitude .

Analysis indicates $\beta = 0.88$, $p < 0.01$. H_o_2 was rejected. This suggests that Sustainable Knowingness has a significant direct effect on Sustainable Attitude

- H_o_3: There is no significant effect of Sustainable Attitude on Sustainable Behavior

Analysis indicates β=0.69, $p<0.01$. H_o_3 was rejected. This suggests that Sustainable Attitude have a significant direct effect on Sustainable Behavior.

This suggests that while sustainable knowingness directly influences sustainable attitudes, it does not have a direct effect on sustainable behavior at a statistically significant level. However, students' sustainable attitudes do have a significant direct effect on their sustainable behaviors.

4.3.2.2.2 Indirect Effects

There was a significant indirect effect of SK on SB through SA ($\beta = 0.61$, $p<0.01$). This indicates that SK influences SB indirectly via its impact on SA. It means that the effect of sustainable knowingness on sustainable behavior is mediated by sustainable attitudes.

4.3.2.2.3 Total Effects

the total effect of SK on SA was significant ($\beta = 0.88$, $p<0.01$). The total effect of SK on SB was positive and significant ($\beta = 0.55$, $p<0.01$)), and the total effect of SA on SB was significant ($\beta = 0.69$, $p<0.01$). It means that students' sustainable knowingness and attitudes collectively contribute to their sustainable behaviors.

To conclude path analysis model demonstrated a good fit to the data ($\chi2(497) = 1069.441$, $p<.001$; $\chi2/df=2.15$; RMSEA = 0.039, 90% CI [0.036, 0.042], Probability RMSEA $\leq .05 = 1.000$; CFI = 0.90; TLI = 0.90; SRMR = 0.05).

The analysis indicated that Sustainable Knowingness significantly predicts Sustainable Attitude ($\beta = 0.88$, $p <0.01$) but does not significantly predict Sustainable Behavior ($\beta = -0.06$, $p =0.07$) directly. Indirect effects on Sustainable Behavior were observed through Sustainable Attitude ($\beta = 0.61$, $p < 0.05$). The indirect effect of

Sustainable Knowingness on Sustainable Behavior through Sustainable Attitude was significant. The total effect of Sustainable Knowingness on Sustainable Behavior was positive and significant ($\beta = 0.55$). The model explained 40% of the variance in the relationships between the variables ($R^2 = 0.40$). It means Sustainable Knowingness and Sustainable Attitude together explain 40% of the variance in Sustainable Behavior. Non-significant effects were removed from the hypothesized model and the model was retested.

4.3.2.3 Model Fit Information of Corrected Model

The model fit indices suggest a good fit for the path analysis model: $\chi2(498) = 1069.599$, $p<.001$; $\chi2/df=2.15$; RMSEA = 0.037, 90% CI [0.036, 0.042], with a probability of RMSEA ≤ 0.05 equal to 1.000, indicating a good fit. The CFI and the TLI were both 0.90, suggesting an acceptable fit. The SRMR was 0.05, also indicating a good fit.

4.3.2.4 Results of Direct, Indirect, and Total Effects of Corrected Model

The path analysis revealed several significant direct and indirect effects, providing insights into how these constructs interact to influence sustainable behavior.

Table 4.12 Direct, indirect and total path coefficients for Corrected Model

	SA			SB		
	Direct	Indirect	Total	Direct	Indirect	Total
SK	0.88	-	0.88	-	0.56	0.56
SA	-	-	-	0.63	-	0.63

Figure 4.9 Path Coefficients for Corrected Model

4.3.2.4.1 Direct Effects

There was a significant direct effect of SK on SB ($\beta = 0.88$, $p < 0.01$). This finding indicates that sustainable knowingness has a direct influence on sustainable behavior

4.3.2.4.2 Indirect Effects

There was also a significant indirect effect of SK on SB through SA ($\beta = 0.56$, $p < 0.01$). This suggests that SK influences SB indirectly via its impact on SA. In other words, the effect of sustainable knowingness on sustainable behavior is mediated by sustainable attitudes.

4.3.2.4.3 Total Effects

the total effect of SK on SA was significant ($\beta = 0.88$, $p<0.01$).The total effect of SK on SB was significant ($\beta = 0.56$, $p < 0.01$), showing that indirect pathways contribute to the influence of sustainable knowingness on sustainable behavior. Additionally, SA had a total effect on SB ($\beta = 0.63$, $p < 0.01$), emphasizing the role of sustainable attitudes in promoting sustainable behavior. It means that students' sustainable knowingness and attitudes collectively contribute to their sustainable behaviors.

To conclude path analysis model demonstrated a good fit to the data ($\chi 2(498) = 1069.599$, $p<0.01$; $\chi 2/df=2.15$; RMSEA = 0.037, 90% CI [0.036, 0.042], Probability RMSEA $\leq$ .05 = 1.000; CFI = 0.90; TLI = 0.90; SRMR = 0.05). The analysis indicated that Sustainable Knowingness significantly predicts Sustainable Attitude ($\beta = 0.88$, $p < 0.01$) directly. Indirect effects on Sustainable Behavior were observed through Sustainable Attitude ($\beta = 0.56$, $p < 0.01$). The indirect effect of Sustainable Knowingness on Sustainable Behavior through Sustainable Attitude was significant. the total effect of SK on SA was significant ($\beta = 0.88$, $p < 0.01$).The total effect of Sustainable Knowingness on Sustainable Behavior was positive and significant ($\beta = 0.56$ $p < 0.01$). and the total effect of SA on SB was significant ($\beta = 0.63$, $p < 0.01$)) The model explained 41% of the variance in the relationships between the variables ($R^2 = 0.41$). This means that Sustainable Knowingness and Sustainable Attitude together explain 41% of the variance in Sustainable Behavior.

CHAPTER 5

DISCUSSION, CONCLUSION AND IMPLICATIONS

The aim of this study was to examine sustainability consciousness levels of ninth-grade students in Turkey and how well students' sustainable behavior levels can be predicted using sustainable knowingness and sustainable attitude levels.Three research questions guide this study. In the following chapter, results of the research were discussed based on the related literature. Moreover, implications and recommendations for the further research were presented.

5.1 Conclusion and Discussion of the Results

To begin with, SCQ was adapted to Turkish by Yüksel and Yıldız (2019) used to assess ninth grade students' SC. Yüksel, and Yıldız (2019) conducted CFA for each factor separately adapting SCQ in Turkish to ensure validity. However, in original scale CFA was conducted in one model for all factors and subfactors. Since original developers of the questionnaire emphasised "the model that was built through theory and intended to show the factor structure as hypothesized'' (Gericke et al., 2019, p.42). Therefore, in this study, factor structure was used in the original scale as hypothesized by Gericke et al. (2019). Moreover, Yüksel and Yıldız (2019) conducted research to adapt SCQ in Black Sea region of Turkey with 1085 students in different grades from four different type of school which are medical high school, vocational high school, science high school and Anatolian high school. However, this study conducted in Southeastern Region of Turkey with 922 high school students in ninth grade from two different type of school which science high school and Anatolian high school.

Therefore, the context and characteristics of the samples in the two studies are quite different, which can affect the results and the need for modifying the scale. Yüksel and Yıldız (2019) used the full scale without removing any items, likely because their sample was more diverse in terms of school types and grade level. However, in our study, it is conducted with ninth graders and more specific sample from only two school types which may have required adjustments to ensure the scale's validity and reliability for the targeted population. Additionally, while no items were removed in Yüksel and Yıldız's adaptation, the characteristics of our sample such as regional differences, school types and grade levels necessitated the removal of certain items to ensure the scale's validity and reliability.

In this study, the sustainability consciousness dimensions of knowingness, attitude, and behavior were examined. The highest mean value was found in the knowingness dimension (M = 4.40), followed by the attitude dimension (M = 4.29), with the behavior dimension exhibiting the lowest mean (M = 3.47). Among the sub-dimensions, environmental knowingness (Kenv: M = 4.51) had the highest mean, followed by economic knowingness (Keco: M = 4.37) and social knowingness (Ksoc: M = 4.35). Regarding the behavior sub-dimensions, environmental behavior (Benv: M = 3.31) had the lowest mean, followed by economic behavior (Beco: M = 3.56), while social behavior (Bsoc: M = 3.85) had the highest mean. Furthermore, in the attitude sub-dimensions, environmental attitude (Aenv: M = 4.44) was the highest, followed by social attitude (Asoc: M = 4.29), with economic attitude (Aeco: M = 4.21) having the lowest mean. Finally, participants' overall sustainability consciousness (SC) level was found to be M = 4.09.

These findings align with those of Michalos et al. (2015), who conducted a similar study with tenth-grade students, reporting the highest mean scores on the knowledge index (M = 4.04) and the lowest on the behavior index (M = 3.34). Additionally, the current results are consistent with Kalssom et al. (2017), who explored sustainability consciousness among pre-service teachers in Pakistan. In that study, pre-service teachers scored M = 3.48 in the knowledge dimension, M = 3.40 in the attitude dimension, and M = 3.25 in the behavior dimension, with an overall SC value of M

= 3.38, while humanities students scored slightly higher across all dimensions (knowledge: M = 3.60, attitude: M = 3.40, behavior: M = 3.24, SC: M = 3.42).

Similarly, the results of this study are consistent with the ranking of knowingness, attitude, and behavior dimensions in a study by Nousheen and Tabassum (2024), which was conducted in Pakistan. Their findings indicated an overall sustainability knowingness of M = 4.80, sustainability attitude of M = 3.65, and sustainable behavior of M = 2.95. In their study, the sub-dimensions of knowingness showed Keco at M = 3.01, Ksoc at M = 3.94, and Kenv at M = 3.50. These results contradict the present study, where Kenv had the highest mean, followed by Keco and Ksoc. In terms of attitudes, the highest mean was found in Aenv (M = 3.67), followed by Asoc (M = 3.62) and Aeco (M = 3.65). Similarly, the behavior sub-dimensions revealed Bsoc (M = 3.10) had the highest mean, followed by Beco (M = 3.02) and Benv (M = 2.74), in contrast to the current study's ranking of Bsoc, Beco, and Benv. Furthermore, Nousheen and Tabassum (2024) calculated the overall SC for their participants as M = 3.36, which is lower than the SC value found in this study.

Moreover, findings from Berglund et al. (2019), who compared sustainability consciousness between students from Taiwan and Sweden, show that both groups scored highest in attitudes (Taiwan: M = 4.13, Sweden: M = 4.49), followed by knowingness (Taiwan: M = 3.94, Sweden: M = 4.18), with behavior ranked third (Taiwan: M = 3.89, Sweden: M = 3.23). Similarly, Vegel (2021) studied sustainability consciousness among undergraduate and graduate students in Spain, finding that the attitude dimension ranked highest (undergraduates: M = 4.71, graduates: M = 4.64), followed by knowingness (undergraduates: M = 4.44, graduates: M = 4.38), and behavior in third place (undergraduates: M = 3.86, graduates: M = 3.96).

Chukwu et al. (2024) investigated the sustainability consciousness of pre-service teachers, reporting that pre-service teachers scored M = 3.68 in the knowledge dimension, M = 4.06 in the attitude dimension, and M = 3.96 in the behavior dimension, with an overall SC value of M = 3.77. Marcos-Merino et al. (2020)

assessed sustainability across environmental, social, and economic dimensions among Spanish pre-service primary teachers, finding that social knowingness (Ksoc: M = 4.60) was highest, followed by environmental knowingness (Kenv: M = 4.41) and economic knowingness (Keco: M = 4.32). Their attitude results were similarly highest in the social dimension (Asoc: M = 4.83), followed by environmental attitude (Aenv: M = 4.69) and economic attitude (Aeco: M = 4.70), which contradict the findings of this study where Aenv had the highest mean. In terms of behavior, Beco had the lowest mean (M = 3.01), while Bsoc (M = 3.98) and Benv (M = 3.88) were ranked higher, again contrasting with the findings of the present study, where Bsoc had the highest mean. These results indicate that an increase in the level of knowingness and attitude may not necessarily translate into a corresponding increase in behavior.

In the current research, sustainability consciousness (SC) and its associated variables were examined in terms of gender differences. Results indicate statistically significant differences in sustainable knowingness (Kenv, Ksoc, Keco) between male and female groups, with males generally scoring higher in these variables. Additionally, statistically significant gender differences were observed in sustainable behavior (Bsoc, Beco), with males again scoring higher. However, no significant gender differences were found for environmental behavior (Benv). Furthermore, significant differences were found in sustainable attitudes (Aenv, Asoc, Aeco), with males generally scoring higher in these variables. Lastly, a statistically significant difference in overall SC scores was found, with males scoring higher than females. In summary, except for Benv, males scored higher than females across all dimensions of SC.

Interestingly, many studies in the literature suggest that females tend to have higher levels of SC and its associated variables compared to males. For example, Berglund and Gericke (2016) conducted a study among Swedish upper secondary students, involving 638 participants aged 18-19. The study revealed statistically significant gender differences favoring females across all SC dimensions. In contrast, a study by Yakışık and Mustafazade (2023) in Turkey, with 489 participants from diverse

demographic backgrounds, found that male participants exhibited higher levels of SC overall, although it did not examine the sub-dimensions of SC.

Marcos-Merino et al. (2020) assessed sustainability knowingness, attitudes, and behaviors across environmental, social, and economic dimensions, revealing gender differences in sustainability behavior, particularly in the economic dimension, where male pre-service teachers reported higher levels of economic behaviors. However, no significant gender differences were found in sustainability attitudes or knowingness, as both male and female pre-service teachers demonstrated similar levels across these dimensions. Similarly, Al-Naqbi and Alshannag (2017) conducted research among university students and found gender differences favoring females in knowingness, but no gender differences in attitude and behavior. Mohamed et al. (2024), studying nursing students in Egypt, found that although female students exhibited higher levels of SC compared to male students, these differences were not statistically significant.

Chen et al. (2022) investigated sustainability literacy among university students in China and found that male students had significantly higher levels of economic knowledge (Keco), while female students exhibited more positive attitudes toward Kenv and K soc, with significantly higher scores in Aenv and Asoc. However, gender differences in sustainable behaviors were not statistically significant. In a similar vein, Heeren et al. (2016) observed gender differences in sustainability knowledge, with males scoring slightly higher, while females were more engaged in sustainable behaviors. Abdul-Wahab and Abdo (2010) examined the role of gender in shaping environmental awareness among Omani citizens and found gender differences favoring males in environmental knowledge, attitude, and behavior.

This finding is consistent with the study by Yakışık and Mustafazade (2023), which also revealed that male participants exhibited higher levels of SC overall, although it did not explore the sub-dimensions. However, contrary to many other studies in the literature, this finding contrasts with those of Berglund and Gericke (2016). They

found that Swedish upper secondary students, aged 18–19, demonstrated gender differences favoring females across all dimensions of SC.

In terms of sustainable behavior (Bsoc, Beco), the current study again showed that males scored higher in both sub-dimensions, aligning with the results of Marcos-Merino et al. (2020), who also reported that male pre-service teachers exhibited higher levels of economic behaviors. However, the present study did not find significant gender differences in environmental behavior (Benv), a finding which diverges from Mohamed et al. (2024). Researchers noted that female students in Egypt exhibited higher levels of sustainable behavior in general, although these differences were not statistically significant.

Regarding sustainable attitudes (Aenv, Asoc, Aeco), the current research found statistically significant differences favoring males, a result similar to the study by Al-Naqbi and Alshannag (2017) which is conducted among university students. However, unlike this study, Al-Naqbi and Alshannag (2017) observed gender differences favoring females in sustainability knowledge, but no gender differences in attitudes or behaviors. Furthermore, Chen et al. (2022) revealed that while male students demonstrated higher economic knowledge (Keco), female students exhibited more positive attitudes toward environmental and social sustainability, which supports the current study's finding of male dominance in environmental and social attitudes but contrasts with the overall higher scores in sustainability consciousness found among males in this study.

Interestingly, the study by Heeren et al. (2016) aligns with the current findings in that gender differences were observed in sustainability knowledge, with males slightly outperforming females, but females showed significantly higher engagement in sustainable behaviors. This result is consistent with the findings of Abdul-Wahab and Abdo (2010), who found males to score higher in environmental knowledge, attitudes, and behaviors, especially in countries with a more patriarchal social structure, like Omani society.

Olsson and Gericke (2017) state that gender differences in SC can be explained by using socialization theory. socialization theory posits that gender differences are not innate but learned through a variety of social agents, including family, peers, and media, all of which contribute to the reinforcement of traditional gender roles (Risman, 2004). Olsson and Gericke (2017) highlighted that "the socially constructed gender stereotypes expect girls to be nurturing, caregiving, and cooperative, whereas boys are expected to be independent and competitive" (p.358). Moreover, Abdul-Wahab and Abdo (2010) argued that much research revealed female were more concerned about the environment than male since male demonstrated a stronger concern for economic growth and economic issues. Abdul-Wahab and Abdo (2010) revealed gender difference favoring males in environmental knowledge, attitude, and behavior, moreover, they argue that this could be linked to the fact that men are more engaged with community matters and tend to have higher levels of education than women, particularly in science-related fields. Researchers also highlighted that "the culture and traditional practices also influences the gender differences between awareness levels if compared in cross-nation context" (Abdul-Wahab & Abdo, 2010, p.398). This study conducted in Gaziantep, Turkey. Gaziantep is a city where the patriarchal social structure is dominant (Özsoy & Sipahi, 2016). This might explain why male participants in this study exhibited higher scores in all dimensions of SC except for environmental behavior. Moreover, Gaziantep is a pivotal industrial and commercial center in Turkey, strategically positioned as an export gateway to the Middle East (Ulusoy & Turan, 2016). This city contributes significantly to Turkey's economy through its expanding export activities (Ulusoy & Turan, 2016). Rich in cultural heritage and historical significance, Gaziantep attracts visitors and investors alike, enhancing its touristic appeal (Ulusoy & Turan, 2016). Socially, Gaziantep experiences considerable migration from neighbouring provinces due to its rapid population growth and abundant economic opportunities (Ulusoy & Turan, 2016). Despite the high rate of young, workable population, problems such as income inequality and poverty still exist in the region (Ulusoy & Turan, 2016). In the field of industry, Gaziantep has

improved its production capacity with organized industrial zones and strong logistics, significantly reducing unemployment (Ulusoy & Turan, 2016). Its modern transportation network and border trade opportunities have made the city an important center of international trade (Ulusoy & Turan, 2016). With all these features, Gaziantep is in a key position both in Turkey's economic development and in trade relations with the Middle East (Ulusoy & Turan, 2016). This result may align with prior research indicating that the effects of gender on environmental behavior and attitudes can vary depending on contextual factors (Steg, 2008). This discrepancy may be attributed to different social contexts and cultural factors.

The current study investigated to what extent students' sustainable behavior levels could be predicted based on their sustainable knowingness and attitudes, utilizing the Knowledge-Attitude-Behavior (KAB) model as a framework. Results indicated that Sustainable Knowingness significantly predicted Sustainable Attitude directly ($\beta = 0.88$, $p < 0.01$). Sustainable Attitude predicted sustainable behavior directly ($\beta = 0.63$, $p < 0.01$). Sustainable Knowingness significantly predicted Sustainable behavior through sustainable attitude indirectly ($\beta = 0.56$, $p < 0.01$). However, the analysis revealed no statistically significant direct effect of sustainable knowingness on sustainable behavior. This might align with related literature since increase in knowledge may not lead to sustainable behavior (Kollmus & Agyeman, 2002). Moreover. Some studies examined the direct relationship between Sustainable knowledge, sustainable knowingness and sustainable behavior. Leal et al. (2024) explored sustainability perceptions among higher education students, focusing on the relationship between their knowledge, attitudes, and behaviors regarding sustainability by using KAB model. They used Sustainability consciousness questionnaire. Leal et al. (2024) found that sustainable knowingness positively predicted sustainable attitude directly ($\beta = 0.91$, $p < 0.05$), sustainable attitude predicted sustainable behavior directly ($\beta = 0.46$, $p < 0.05$), sustainable knowingness predicted sustainable behavior directly ($\beta = 0.44$, $p = .017$), sustainable knowingness predicted sustainable behavior indirectly via sustainable attitude ($\beta = 0.41$, $p = .009$). According to Domínguez-Valerio et al. (2019) conducted a study to detect high

school students' sustainable knowingness, sustainable attitude and sustainable behavior by adapting SCQ and in the Dominican Republican and they found that there was a significant direct effect sustainable knowingness on sustainable attitude ($\beta = 0.65$, $p < 0.05$) and sustainable attitude on sustainable behavior directly ($\beta = 0.25$, $p < 0.05$) , however, there was no significant direct effect of sustainable knowingness on sustainable behavior ($\beta = 0.39$, $p > 0.05$). Moreover, sustainable knowingness significantly predicts sustainable behaviour through sustainable attitude indirectly ($\beta = 0.16$, $p < 0.05$).

Moreover, Seock, Shin, and Yoon (2024) conducted a study to examine the impact of environmental sustainability consciousness on Generation Z and Millennial's slow fashion behaviors by using KAB model. Study revealed that Environmental knowingness (Kenv) predicted environmental sustainability attitudes (Aenv) directly ($\beta = 0.68$, $p < 0.05$). Kenv predicted slow fashion behavior ($\beta = 0.16$, $p < 0.05$). Aenv directly predicted slow fashion behavior ($\beta = 0.31$, $p < 0.05$). Kenv predicted slow fashion behavior through Aenv indirectly (Seock, Shin, & Yoon, 2024).

In another study which examine the relationship between environmental knowledge, environmental attitude and pro environmental behavior, it was found significant weak direct effect environmental knowledge on proenvironmental behavior (Dopelt, Loren, Gapich, & Davidovitch, 2021). Moreover, there was significant direct affect environmental knowledge on environmental attitude and environmental attitude on pro environmental behavior, moreover, environmental behavior significantly predicts environmental behavior through environmental attitude (Dopelt et al., 2021).

To conclude, these findings underscore the importance of the mediating role of sustainable attitudes in the Knowledge-Attitude-Behavior model. While knowingness alone may not directly lead to sustainable behavior, fostering positive attitudes appears to be a critical pathway for translating sustainable knowingness into sustainable behaviors.

5.2 Implications of the Study

The current study highlights sustainability consciousness and associated variables which are sustainable knowingness, sustainable attitude and sustainable behavior of ninth grade students in Turkey. Although there are many research conducted the variables; environmental awareness, environmental attitude, environmental knowledge and environmental behavior, there are few research which is conducted to explain sustainable consciousness, sustainable knowingness, sustainable attitude and sustainable behavior. Since sustainability consciousness, sustainable knowingness, sustainable attitude and sustainable behavior includes three pillars of sustainable development which are environment, social and economy. To achieve sustainable development, it is crucial to recognize that sustainability is not limited to the environmental dimension; economic and social dimensions are equally important (UNESCO, 2005). Moreover, present study highlights how sustainable knowingness, sustainable attitude predicts sustainable behavior. Due to the fact that changing behavior is seen as only way to achieve sustainable development **(**Schultz, 201). Moreover, Education is seen as a crucial factor to achieve SD. UNESCO (2005) emphasised "the need for more research, innovation, monitoring and evaluation to develop and prove the effectiveness of ESD good practices" (p.10). Therefore, SDGs emphasise the importance of education to achieve SD in goal 4. Goal 4 states that "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development.", moreover, "By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations." (United Nations, 2015, pp. 19-20). Considering these aspects, this study also examines gender differences. Since gender equality also seen as key goal to achieve SD (goal 5). Goal 5 states that "Achieve gender equality and empower all women and girls" (United Nations, 2015, p.23). Therefore, results of this study important to evaluate and critique current situation in terms of SD and ESD in Turkey. The results indicate that achieving gender equality

and empowering all women and girls remains a critical challenge, as male participants demonstrated a higher level of sustainable consciousness compared to their female counterparts.

The findings of this study have important implications for addressing gender disparities in sustainable development and education for sustainable development (ESD). They emphasize the need to develop gender-sensitive policies, educational programs, and community initiatives that can foster equitable sustainable consciousness. By shedding light on these disparities, the study contributes to Sustainable Development Goals (SDGs) 4 (quality education) and 5 (gender equality), while also supporting efforts to promote more inclusive sustainability practices. The direct and indirect paths observed in this study—where Sustainable Knowingness predicts Sustainable Attitude and subsequently, sustainable behavior—suggest that a comprehensive approach to ESD should not only focus on knowledge but also aim to cultivate positive attitudes toward sustainability. The lack of a direct effect of Sustainable Knowingness on Sustainable Behavior indicates that attitude plays a mediating role. Therefore, this highlights the need to incorporate attitude-based strategies into educational programs. These results align with UNESCO's (2005) call for "more research, innovation, monitoring and evaluation to develop and prove the effectiveness of ESD good practices" (p. 10). Thus, the study provides a foundation for improving ESD practices in Turkey and beyond, encouraging a holistic approach to sustainability that includes everyone.

5.3 Limitations and Recommendation for Further Research

The current study presents sustainability consciousness of the ninth-grade students in one of the largest cities in Turkey. Moreover, this study conducted in science high schools and Anatolian high schools with a 922 sample. Further research may be conducted in different cities, and different type of schools in Turkey. Due to selection of convenience sampling method, which is a non-random sampling method, the results of this study may not be generalizable to the broader population, as the sample

may not be fully representative of the target population. Therefore, further research can be conducted using random sampling method to enhance the representativeness of the sample and improve the generalizability of the findings.

Moreover, in the current study SCQ were used to measure ninth grade students' SC which is adapted in Turkish by Yüksel and Yıldız (2019). Reliability and validity analysis for this study revealed that Turkish version of this scale can be revised and developed for further research to obtain more accurate and consistent results, enhancing its applicability across diverse populations and contexts.

In this study, Knowledge-Attitude-Behavior (KAB) model was used as a framework to explain the determinants of sustainable behavior. Kollmus and Agyeman (2002) argued that this model may not fully explain the relationship between knowledge, attitude, and behavior. They pointed out that increased environmental knowledge does not always lead to a positive attitude or behavior. Additionally, attitudes may not always result in action. Moreover, in the literature there are various variable effects sustainable behavior presented in different models. Therefore, different models can be used in further research such as Models of predictors of environmental behavior by Hines, Hungerford and Tomera (1987), The Value-Belief-Norm (VBN) theory, The Theory of Reasoned Action (TRA) and Theory of planned behaviour (TPB) to explain sustainable behavior comprehensively.

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APPENDICES

A. Data Collection Tools for the Present Study

Değerli Katılımcılar,

Bu çalışmanın amacı 21. Yüzyıl Becerileri ve Sürdürülebilir Bilince yönelik görüş ve düşüncelerinizi almaktır. Birinci bölümde kişisel bilgilerinizi, diğer bölümlerde ise yönergeleri okuyarak görüşlerinizi verilen ölçek üzerinde belirtmeniz beklenmektedir. Anketin tamamlanması yaklaşık 20 dakikanızı alacaktır. Bu çalışmaya katkılarınız gönüllü olmanıza bağlı olup, görüşleriniz çalışmanın sonuçlandırılabilmesi açısından çok değerlidir. Kişisel bilgileriniz ve sorulara vereceğiniz yanıtlar, bilimsel amaçlı kullanılacak ve kesinlikle gizli tutulacaktır. Katılımınız ve katkılarınız için teşekkür ederiz. Araştırma hakkında daha fazla bilgi almak için Melike ARAS (melike.aras@metu.edu.tr) ile iletişim kurabilirsiniz.

KİŞİSEL BİLGİLER ÖLÇEĞİ

1. Cinsiyetiniz: ❑Kadın ❑ Erkek

2. Yaşınız: : ❑13 ❑14 ❑15 ❑15 ve üstü

4. Öğrenim gördüğünüz lise: :
❑ Anadolu Lisesi
❑ Anadolu İmam Hatip Lisesi
❑ Mesleki ve Teknik Anadolu Lisesi
❑ Fen Lisesi

A. Data Collection Tools for the Present Study

SÜRDÜRÜLEBİLİR BİLİNÇ ÖLÇEĞİ

SÜRDÜRÜLEBİLİR BİLİNÇ ÖLÇEĞİ	Tamamen Katılıyorum	Katılıyorum	Kısmen Katılıyorum	Katılmıyoru	Hiç Katılmıyoru
1. Sürdürülebilir gelişme için ekonomik gelişme gereklidir.	5	4	3	2	1
2. İnsan sağlığını ve yaşam standartlarını geliştirmek sürdürülebilir gelişmeye katkıda bulunur.	5	4	3	2	1
3. Su tüketimini azaltmak sürdürülebilir gelişme için gereklidir.	5	4	3	2	1
4. Doğayı korumak sürdürülebilir gelişme için gerekli değildir.	5	4	3	2	1
5. Toplumlarda anlaşmazlıkların barışçıl bir şekilde çözülmesi sürdürülebilir gelişme için gereklidir.	5	4	3	2	1
6. Sürdürülebilir gelişme insanların her türden atığı azaltmasını gerektirir.	5	4	3	2	1
7. Demokratik haklarını kullanan insanlar sürdürülebilir gelişme için gereklidir. (Örneğin seçimlerde oy kullanırlar, sosyal sorunlarla ilgilenirler, fikirlerini ifade ederler)	5	4	3	2	1
8. Tüm dünyada kadın haklarını güçlendirmek sürdürülebilir gelişme için gereklidir.	5	4	3	2	1
9. İnsan haklarına saygı göstermek sürdürülebilir gelişme için gereklidir.	5	4	3	2	1
10. Sürdürülebilir gelişmeyi sağlamak için dünyadaki tüm insanların iyi ve kaliteli eğitime ulaşabilmesi gerekir.	5	4	3	2	1
11. Sürdürülebilir gelişmeyi sağlamak için şirketler çalışanlarına, müşterilerine ve tedarikçi firmalara adil davranmalıdır.	5	4	3	2	1
12. Doğadaki tür çeşitliliğini korumak sürdürülebilir gelişme için gereklidir.	5	4	3	2	1
13. Farklı kültürlere saygı göstermek sürdürülebilir gelişme için gereklidir.	5	4	3	2	1
14. Sürdürülebilir gelişme dünyadaki tüm insanlar arasında gıda ve sağlık hizmeti gibi temel insani hakların adil dağıtılmasını gerektirir.	5	4	3	2	1
15. Dünyadaki yoksulluğu bitirmek sürdürülebilir gelişme için gereklidir.	5	4	3	2	1
16.Sürdürülebilir gelişme yenilenebilir kaynaklara geçiş yapmayı gerektirir (Yenilenebilir kaynaklar rüzgâr enerjisi, güneş panelleri, Biyo- atıklardan elde edilen etanol gibi kaynakları içerir)	5	4	3	2	1
17. Sürdürülebilir gelişme insanların ekonominin nasıl işlediğini anlamasını gerektirir.	5	4	3	2	1
18. Sürdürülebilir gelişme için HIV/AIDS ve sıtma gibi önemli bulaşıcı hastalıkların yok edilmesini gerektirir.	5	4	3	2	1
19. Sürdürülebilir gelime için, insanların doğal afetle re karşı kendilerini nasıl koruyacakları konusunda eğitilmeleri gerekir.	5	4	3	2	1
20. Nasıl sürdürülebilir yaşanacağı konusunda herkese eğitim verilmesi gerektiğini düşünüyorum	5	4	3	2	1
21. Bizden sonrakilerin de bugün bizim yaşadığımız kaynak bolluğuna sahip olmalarını sağlamalıyız.	5	4	3	2	1
22. Şirketlerin ambalaj ve tek kullanımlık eşya kullanımını azaltma sorumluluğu olduğunu düşünüyorum.	5	4	3	2	1

A. Data Collection Tools for the Present Study

23. Doğal kaynakları ihtiyacımızdan fazla kullanmak insan sağlığını veya gelecekteki refah seviyemizi tehdit etmez.	5	4	3	2	1
24. Çevreyi korumak için daha katı kanun ve düzenlemelere ihtiyacımız olduğunu düşünüyorum.	5	4	3	2	1
25. Yoksulluğu azaltmanın önemli olduğunu düşünüyorum.	5	4	3	2	1
26. Büyük şirketlerin fakir ülkelerdeki çalışanlarına zengin ülkelerdekiyle aynı şartları sağlaması gerektiğini düşünüyorum.	5	4	3	2	1
27. İklim değişikliği ile ilgili sorunlar hakkında bir şeyler yapılmasının önemli olduğunu düşünüyorum.	5	4	3	2	1
28. Vatandaşların çevre dostu araçlar almaları için hükümetlerin finansal destek sağlaması gerektiğini düşünüyorum.	5	4	3	2	1
29. Hükümetlerin tüm kararlarını sürdürülebilir gelişmeyi ön planda tutarak alması gerektiğini düşünüyorum.	5	4	3	2	1
30. Toplumdaki bireylerin seçimlerde oy kullanmalarının ve önemli konularda görüşlerini ifade etmelerinin önemli olduğunu düşünüyorum	5	4	3	2	1
31. Toprağı, havayı ve suyu kirleten insanların çevreye verdiği bu zarara karşılık ceza ödemesi gerektiğini düşünüyorum.	5	4	3	2	1
32. Dünyanın her yerinde kadın ve erkeklere eşit eğitim ve iş olanağı sağlanması gerektiğini düşünüyorum.	5	4	3	2	1
33. İnsanların istedikleri kadar su kullanmalarının sorun olmadığını düşünüyorum.	5	4	3	2	1
34. Mümkünse bir yere giderken bisikletle veya yürüyerek gitmeyi tercih ederim.	5	4	3	2	1
35. Asla su israfı yapmam.	5	4	3	2	1
36. Olabildiğince geri dönüşüm yapıyorum.	5	4	3	2	1
37. Bilgisayar veya telefonda sohbet edip, mesaj yazıp, oyun oynarken karşımdaki insanlara gerçek hayatta davrandığım gibi saygılı davranırım.	5	4	3	2	1
38. Sağlığım için iyi olmayan şeyleri sık sık yaparım.	5	4	3	2	1
39. Fakir insanlara yardımcı olacak işler yaparım.	5	4	3	2	1
40. Çöpleri şehir dışında, piknik ve mesire alanı gibi yerlerde de görsem toplarım.	5	4	3	2	1
41. Yaptığım şeylerin çevreye zarar verip vermeyeceğini düşünmem.	5	4	3	2	1
42. İnternetten veya mağazadan sık sık ikinci el ürün alırım.	5	4	3	2	1
43. İmkânım olduğunda evsel atıkları ayrı çöp olarak ayırırım.	5	4	3	2	1
44. Çalışanlarına ve çevreye karşı kötü bir ünü olan firmaların ürünlerini almaktan kaçınırım.	5	4	3	2	1
45. Daha az atık çıkarmaya çalışırım (daha az yiyecek atmak ve kâğıt israfı yapmamak gibi)	5	4	3	2	1
46. Okulda sosyal kulüplerde çalışırım.	5	4	3	2	1
47. Benden farklı bir kültüre sahip olsa bile herkese aynı saygı çerçevesinde davranırım.	5	4	3	2	1
48. Bir yardım organizasyonu veya çevre grubunu destekliyorum.	5	4	3	2	1
49. Ekonomiyle ilgili programlar veya gazete makalelerini takip ederim.	5	4	3	2	1
50. Kadın ve erkeklere aynı derecede saygı gösteririm.	5	4	3	2	1

B. Scale Usage Permission for Turkish version of Sustainability Consciousness Questionnaire

SÜRDÜRÜLEBİLİR BİLİNÇ ÖLÇEĞİ KULLANIM İZNİ

Re: Sürdürülebilir Bilinç ölçeği kullanım izni hakkında

Yücel Yüksel göndericisinden 2023-03-01 19:46 tarihinde
Ayrıntılar Düz Metin

İyi günler. Kullanabilirsiniz tabiki. Kolaylıklar dilerim

1 Mar 2023 Çar 19:45 tarihinde e204809 <melike.aras@metu.edu.tr> şunu yazdı:

> Merhaba Sayın Hocalarım,
>
> Ben Melike Aras, Ortadoğu Teknik Üniversitesi Fen Eğitiminde yüksek lisans öğrencisiyim. Tezimde sizin Türkçeye adapte ettiğiniz Sürdürülebilir Bilinç ölçeğini, sizin de izniniz olursa, kullanmak istiyorum.
>
> Saygılarımla,
> Melike Aras

C. Ethical Permission From METU Human Subjects Ethics Committee

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ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

Konu: Değerlendirme Sonucu

16 AĞUSTOS 2023

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Prof.Dr. Elvan ŞAHİN

Danışmanlığını yürüttüğünüz Melike ARAS'ın ***"YENİ NESİLLERDE 21. YÜZYIL BECERİLERİ VE SÜRDÜRÜLEBİLİRLİK BİLİNCİ"*** başlıklı araştırmanız İnsan Araştırmaları Etik Kurulu tarafından uygun görülerek **0380-ODTUİAEK-2023** protokol numarası ile onaylanmıştır.

Bilgilerinize saygılarımla sunarım.

Prof. Dr. Ş. Halil TURAN
Başkan

Prof.Dr. İ. Semih AKÇOMAK
Üye

Doç. Dr. Ali Emre Turgut
Üye

Doç. Dr. Şerife SEVİNÇ
Üye

Doç.Dr. Murat Perit ÇAKIR
Üye

Dr. Öğretim Üyesi Süreyya ÖZCAN KARASAKAL
Üye

Dr. Öğretim Üyesi Müge GÜNDÜZ
Üye

D. Ethical Permission From Ministry of Education

T.C.
GAZİANTEP VALİLİĞİ
İl Millî Eğitim Müdürlüğü

Sayı : E-34659092-605.01-91778977 11/12/2023
Konu : Araştırma İzin Talebi
(Melike ARAS)

VALİLİK MAKAMINA

İlgi: Orta Doğu Teknik Üniversitesi Rektörlüğünün Bila tarihli ve 54850036 sayılı yazısı.

Orta Doğu Teknik Üniversitesi Matematik ve Fen Bilimleri Eğitimi Ana Bilim Dalı Fen Bilimleri Eğitimi Yüksek Lisans Programı Öğrencisi Melike ARAS'ın, Prof. Dr. Elvan ŞAHİN danışmanlığında yürüttüğü "Lise Öğrencilerinin 21. Yüzyıl Becerileri ile Sürdürülebilir Bilinci Seviyeleri Arasındaki İlişki" konulu anket uygulama isteği kapsamında, Müdürlüğümüze bağlı bulunan Liselerde öğrenim gören öğrencilere yönelik Anket Uygulama İsteği, ilgi yazıda belirtilmektedir.

Bu kapsamda bahsi geçen Anket Uygulama İsteği, Bakanlığımız Yenilik ve Eğitim Teknolojileri Genel Müdürlüğünün 21.01.2020 tarihli ve 2020/2 sayılı genelgesi kapsamında değerlendirilmiş olup; araştırmacının, araştırmasının bitiminden itibaren 15 gün içerisinde araştırma sonuçlarını 2 kopya halinde CD içerisinde Müdürlüğümüze bildirmesi şartıyla, Müdürlüğümüze bağlı bulunan Liselerde öğrenim gören öğrencilere yönelik anket uygulama isteğinin, eğitim öğretimi aksatmayacak şekilde gönüllülük esasına göre uygulanması Müdürlüğümüz Ar-Ge bürosu bünyesinde oluşturulan komisyonun uygunluk raporu doğrultusunda uygun mütalaa edilmektedir.

Makamınızca da uygun görüldüğü takdirde; Olurlarınıza arz ederim.

Yasin TEPE
İl Milli Eğitim Müdürü

OLUR
Murat AKYÜZ
Vali a.
Vali Yardımcısı

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