EXPLORING TEACHER-EDUCATORS' TEACHING STYLES AND STUDENT-TEACHERS' SUSTAINABILITY CONSCIOUSNESS

By

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NATIONAL UNIVERSITY OF MODERN LANGUAGES
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The undersigned certify that they have read the following thesis, examined the defense, are satisfied with the overall exam performance, and recommend the thesis to Faculty of Social Sciences for acceptance:

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Name of Discipline

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I   **Ayesha Nousheen**

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Candidate of **Doctor of Philosophy** at the National University of Modern Languages, Islamabad do hereby declare that the thesis **"Exploring Teacher-educators' Teaching Styles and Student-Teachers' Sustainability Consciousness"** submitted by me in partial fulfillment of PhD degree, is my original work, and has not been submitted or published earlier. I also solemnly declare that it shall not, in future, be submitted by me for obtaining any other degree from this or any other university or institution.

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                                             Ayesha Nousheen
_____
Name of candidate

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ABSTRACT

Thesis Title: Exploring Teacher-educators' Teaching Styles and Student-Teachers' Sustainability Consciousness

Education for Sustainable Development (ESD) has become a vital field of research and a central approach for educating individuals about the complex global challenges facing the world today. The study aimed to explore the teacher-educators' teaching styles while educating students for sustainable development and student-teachers' sustainability consciousness in seven public sector institutions of Rawalpindi and Islamabad, and to find out the effectiveness of teaching styles on student-teachers' sustainability consciousness. A convergent parallel mixed methods design was applied. The population of the study was 1986 student-teachers, and a stratified random sampling technique was used to select the sample. Data were collected using a teaching styles questionnaire based on Grasha (1996) Teaching Styles framework and a sustainability consciousness questionnaire rooted in Gericke et al. (2019) framework. Semi-structured interviews were also conducted for qualitative data. Descriptive and inferential statistics, as well as Structural Equation Modelling (SEM) were applied using SPSS 24 and Smart PLS 4.0 respectively for quantitative analysis, and themes were derived from qualitative data. The results showed that most student-teachers perceived the expert teaching style as the most prevalent and have above average knowledge and attitude towards sustainable development but below average behavior towards sustainable development. The study also found that all teaching styles have a positive significant effect on student-teachers' knowledge and attitude towards sustainable development, except for the personal model teaching style which did not affect any dimension of sustainability consciousness. Based on the results, it is recommended that dedicated courses related to sustainable development needs to be introduced in teacher-education programs and training of pre-service and in-service teachers is area that needs to be addressed for a thorough integration of ESD into the education system. The area of economic dimension needs to be addressed as for sustainable development. The study recommends that teacher-educators may focus on promoting sustainability attitude and behavior in students by incorporating mixed teaching styles. Additionally, teachers may encourage student-centered approaches to promote positive attitudes towards sustainability.

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LIST OF ABBREVIATIONS

SDG	Sustainable Development Goals
ESD	Education for Sustainable Development
UNDP	United Nations Development Program
UNESCO	United Nations Education Scientific Cultural Organization
UNDESD	United Nations Decade of Education for Sustainability
MDG	Millennium Development Goals
B.Ed.	Bachelor of Education
UN	United Nations
HEC	Higher Education Commission
WCED	World Commission of Environmental Development
NACTE	National Accreditation Council for Teacher Education
USAID	United States Assistance for International Development
EFA	Education for All
ANOVA:	Analysis of Variance
α	Cronbach's Alpha

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ACKNOWLEDGEMENTS

Dedication

This thesis is dedicated

To my beloved

son

Muhammad Umar Abdullah

whose smile encourages me to struggle more in life.

CHAPTER 1

INTRODUCTION

1.1   Background of the study

Sustainable Development (SD) has emerged as a new concept in the field of research and a critical area for addressing complex global issues. The pressing issues of climate change, growing pollution levels, widespread starvation, and the overwhelming number of out-of-school children, as well as conflicts and other socio-economic difficulties, all require comprehensive environmental, economic, social, and political reforms (Phuong et al., 2018). In light of this, education has been recognized as a crucial tool in promoting environmental awareness and sustainability among future generations. One approach to addressing these challenges is through the implementation of sustainability education into the educational system (Ramos et al., 2015).

Teacher-education programs have been identified as a key source to integrate sustainability education into the mainstream educational system. Moreover, teacher-educators and student-teachers are two critical components of teacher education to promote and achieve sustainability goals and objectives in the longer run (Wolff et al., 2017). A teacher-educator can be defined as an individual whose task is to train future teachers in higher education institutions (Kabakci et al., 2010; Smith, 2003). Teacher-educators play a crucial role in shaping the knowledge, values, attitudes, beliefs, and behavior of student-teachers, who will in turn influence their students in future teaching (Nousheen et al., 2022). Therefore, effective integration of sustainability into our educational system requires that teacher-educators must play their part in preparing student-teachers for their future role (Blazar, 2020). However, students' learning largely

depends on their teacher's teaching style (i.e., values, beliefs, and instructional methods) (Phuong et al., 2018). Teacher-educator teaching styles refer to the approaches and methods employed by teacher-educators who educate and train future teachers. These styles encompass various instructional strategies and techniques used to facilitate effective learning and development of teaching skills in aspiring educators. (Chan et al., 2021).

Education for Sustainable Development (ESD) is an innovative educational approach that recognizes the crucial role of teaching and learning in shaping a more sustainable future. It aims to empower individuals to take greater personal responsibility and actively engage in sustainability initiatives. The objective of ESD is to equip individuals with the necessary competencies to become active and responsible citizens, capable of making informed and complex decisions (Ferreira et al., 2020; Li, 2021; Olsson, 2014). This new paradigm of education necessitates a re-evaluation of traditional learning outcomes, with a renewed emphasis on preparing citizens who are knowledgeable, responsible, democratic, engaged, and who contribute to the betterment of humanity (Gatti et al., 2019; Leicht et al., 2018).

All educational and instructional experiences should incorporate learning goals that align with the principles of sustainability. One of the key goals of all the sustainability educational experiences is to enhance students' consciousness to helps them develop critical thinking skills, promotes empathy, understanding of diverse perspectives, and encourages active engagement in issues affecting their communities and the world. This can lead to greater academic success, personal growth, and a more just and equitable society. Teachers can help foster students' consciousness and equip them with the skills and understanding necessary to create a better world by encouraging critical thinking, providing diverse perspectives, and using appropriate

instructional techniques. The teacher's ability to enhance student learning and consciousness depends on teacher teaching styles (Ferreira et al., 2006; Nousheen & Kalsoom, 2022).

Teaching styles have been identified as a significant predictor of the students' learning and achievement (Mukagihana et al., 2022; Tai, 2012). The concept of teaching style pertains to the persistent and consistent patterns of behavior demonstrated by a teacher across time and various educational contexts (Ghanizadeh, & Jahedizadeh, 2016). These recurring patterns of behavior create a distinctive quality that is not restricted to a particular subject matter, but rather is a characteristic aspect of the teacher's methodology (Strawhacker et al., 2018; Li et al., 2019). Researchers have categorized and identified several teaching styles (Chetty et al., 2019; Dunn & Dunn, 1979; Fischer & Fischer, 1979; Michel et al., 2009). Each style is defined by its primary mode of teaching behavior, even though a teacher may exhibit elements of multiple styles (Conti, 1985). The notion of teaching style is considered as a theoretical concept that can be utilized to explain and comprehend various observable aspects of the teaching-learning dynamic (Civitillo et al., 2019; Polly et al., 2013). This concept serves as a valuable tool for analyzing and comprehending the complexities of the teacher-student relationship and can provide insight into crucial aspects of the educational process (Danişman et al.,2019; Fischer & Fischer, 1979; Gill, 2021).

Many researchers proposed various models for effective teaching to enhance student learning and achievement (Farashahi & Tajeddin, 2018; Raba, 2017; Young et al., 2003). A large number of researchers endorsed the idea of adopting an appropriate teaching style to facilitate student learning and achievement (Mukagihana et al., 2022; Silvernail, 1989; Wetzel et al., 1982). Some researchers are of the view that the educational processes not only affect student achievement in the short-term, but may

also influence individual future life and outcomes (Hidalgo-Cabrillana & Lopez-Mayan, 2018). Hidalgo-Cabrillana and Lopez-Mayan (2018) conducted a study to investigate the effectiveness of modern and traditional teaching styles on student achievement and found that modern teaching styles and practices are more related to higher student achievement. Teachers have the responsibility to maintain an environment conducive to student learning and motivation, and hence boosting their interest to learn novel concepts and techniques (Kpolovie & Okoto, 2014).

Many studies are evident in the important role of teaching styles in learning and achievement in traditional settings, but the extent to which these teaching styles affect learning specifically in perspective of ESD is the area that requires consideration of teachers, researchers, academicians, and policymakers. Few researchers have studied sustainability from the pedagogical, curriculum, and learning outcome perspective (Kalsoom, 2017).

Student learning and development is the prime priority and desired outcome at all levels of the educational system (Guo & Shi, 2016; Silins & Mulford, 2002). According to Shuell (1986), learning is the process of modifying / replacing the existing knowledge or skills with new knowledge or skills to reshape individual attitude and behavior to a relatively endured level. Learning can be both cognitive and affective (Ellis, 2000). Sustainability consciousness is a combination of both the cognitive and affective domains of learning. The cognitive domain refers to the knowledge of the sustainability concept concerning the three dimensions of the SD. While on the other hand, the affective domain refers to the change in attitude and behavior of the individual regarding sustainable development (Kalsoom, 2017). Sustainability consciousness (SC) has been identified as an essential outcome of sustainability education (Kalsoom & Khanam, 2017). Olsson et al., (2016) stated that SC is the combination of knowledge,

attitude and behavior pertinent to the three dimensions of SD (i.e., environment, economy, and society). SC refers to an individual's awareness and understanding of environmental, social, and economic issues, as well as their ability to take action to promote sustainable practices (Gericke et al., 2019). It has three dimensions i.e., sustainability knowingness, sustainability attitude, and sustainability behavior. For sustainability, Olsson et al. (2016) proposed that both cognitive and affective domains should be incorporated into classroom instruction. Conteh (2020) emphasized the importance of providing students with new opportunities, in addition to traditional teaching practices, to promote critical thinking and innovation, and to enhance their knowledge, skills, and abilities.

Many researchers have emphasized the need to investigate the role of teachers' teaching styles on student learning outcomes and achievement (Nghia et al., 2020). As future educators, student-teachers can play a critical role in shaping the attitudes and behaviors of future generations towards sustainability. Therefore, it is essential to understand the level of sustainability consciousness among student-teachers and how it may be influenced by the teaching styles of their teacher-educators. SC encompasses both cognitive and affective aspects of learning.

The topic of teacher-educators' teaching styles and student-teachers' sustainability consciousness is a crucial area of research in the field of education. Teachers have been acknowledged as a key component in the integration of Education for Sustainable Development (ESD) into the educational system (Timm & Barth, 2021). However, in order for instructors to fully realize their potential in the years ahead, it is imperative that ESD be incorporated into teacher education. This presents both an opportunity and a challengeThe United Nations (UN) has emphasized the importance of education, particularly teacher education, in the context of ESD integration in several

publications over the years (Buckler & Creech, 2014; Leicht et al., 2018). It is widely recognized that teachers serve as critical facilitators of students' sustainability knowledge, attitudes, abilities, and behavior (Kalsoom, 2017). Therefore, the role of teacher-educators is of paramount importance, as they play a critical role in training and preparing teachers for future teaching responsibilities. Many academics and adult learning theorists have suggested that the teaching style and approaches of a teacher have a substantial impact on students' academic growth and development (Conti, 1985; Mezirow, 1991; Tokac et al., 2019; Zhang et al., 2019).

Teacher-educators play a vital role in shaping the future of education and their teaching styles can greatly influence the learning experiences of their students. Different teaching style can lead to different levels of student engagement, motivation and understanding. A study conducted in a southern Texas adult education program (Conti, 1984) found a relationship between teaching style and student learning. The results of the analysis showed that the teacher's teaching style significantly affected students' academic achievement (Conti, 1985). It is crucial to comprehend the aspects of teaching styles that promote / prevent student internalization and behavioral engagement. Empirical research has revealed that teacher teaching styles can affect motivational regulations and students' fundamental psychological needs (Haerens et al., 2015). Teacher teaching style can lead to positive / negative cognitive, emotional, and behavioral outcomes (Deci & Ryan, 2000). Teacher's teaching style may interfere with students' psychological needs and result in positive / negative outcomes. Therefore, it is important to understand the teaching styles of teacher-educators and how they may impact the development of sustainability consciousness in student-teachers. The effect of teaching styles on students' learning and achievement has been studied in various subjects, i.e. history (Ibrahim & Ahmad, 2016), Mathematics (Akiba & Liang, 2016),

ICT (Comi, Argentin, Gui, Origo, & Pagani, 2017), Science (Mikeska et al., 2017), Statistics and Material Mechanics (Arfandi, Pertiwi, & Jurhanah, 2018), Biology (Audu, 2018), Pharmacy Courses (Shi, Shan, & Tian, 2007), foreign languages (Ivanova, Shlenskaya, Mekeko, & Kashkarova, 2019) and so on so forth. Although many researchers provided "good teaching practices" to promote sustainability in the classroom, however, most of the studies are rather inconclusive or merely focuses on one dimension/method of teaching (Jones, Selby, & Sterling, 2010; Kalsoom, Khanam, & Quraishi, 2017). There is a dire need to investigate various teaching styles on students' learning outcomes (sustainability consciousness) in sustainability perspective in Pakistani context.

The importance of understanding the relationship between teacher-educators' teaching styles and student-teachers' sustainability consciousness cannot be overstated. However, research in this area has been limited. Previous studies have primarily focused on either the teaching styles of teacher-educators or the sustainability consciousness of students, but there is a dearth of literature that examines the connection between the two. The aim of this research is to bridge this gap by investigating the relationship between teacher-educators' teaching styles and student-teachers' sustainability consciousness through a comprehensive study.

1.2   Rationale of the Study

Since the emergence of the SD, among other things, its integration into the educational organization has been the prime priority to encounter the existing challenges and prepare individuals for their future role (van Vuuren et al., 2022). The education sector, especially teacher-education programs, have been identified as the key space for integrating/imparting sustainability education as these programs are meant to prepare individuals for their future professional and societal roles. In view of

this, teacher-education programs are crucial for implementing sustainability education. Goal 4 of the 17 SDGs is connected to education and emphasizes providing a free, universal, and high-quality education to all children and youth. Further, among other targets of the Goal 4, target 4.7 state that:

> *"By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through ESD and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development".*

Further, target 4.c emphasizes the supply of qualified teachers. Although, all the targets are important, however, achieving Goal 4 is the most important because it helps in achieving all the other SDGs. Further, the teacher-education has the most important role in achieving both targets 4.7 and 4.c. Various initiative have been taken in order to meet the Millennium Development Goals (MDGs), integrate ESD into the educational system, facilitating the achievement of targets 4.7 and 4.c. One such initiative is the addition of sustainability-related courses in the educational system. Sustainability curricula have also been included in the various teacher-education programs and aimed to reshape or direct students' knowledge and attitude in sustainability direction.

Teacher-educator being the propagator, transmits the necessary information/knowledge to the student-teachers who will be responsible to take over the teaching role in future classrooms. However, the learning outcomes of ESD-related course are still not achieved. UNESCO and Education International studied 58,000 teachers globally in 2021 and found that although many are motivated, a quarter lack the confidence to teach about SD. This lack of confidence is generally associated with the lack of knowledge related to ESD and its themes.

Foregone in view, it is imperative to assess the current educational processes i.e., curriculum, teaching, and learning. As discussed earlier, the teacher-education program includes SD curriculum. Some of the prominent examples of sustainability curricula in teacher-education have been reported in the literature (Kalsoom, 2017; Khanum, 2019; Durrani et al., 2019; Bano et al., 2021). However, investigating the role of teaching in sustainability learning facets need deliberation. Although, sustainability education learning outcomes, i.e., knowledge, attitude, and behavior for SD has been studied in the Pakistani context (Kalsoom, 2017; Kalsoom & Khanam, 2017; Kalsoom et al., 2017), however, the teaching component has not been completely study in previous researches. Further, these previous studies have been carried out with a limited sample, i.e., students' SC was assessed at the end of a research methodology course.

The current study fills this gap by investigating both the teaching (teaching styles) and learning outcome (sustainability consciousness) in a broader perspective, i.e., by selecting of a representative sample studying courses pertinent to SD. The current study will be first of its type to explore the student-teachers SC, their teacher-educator teaching styles, and the relationship between these two key variables of the learning environment.

Moreover, there was a disparity in the amount of research directed to investigate sustainability in Higher Education (HI) coming from various parts of the world (Barth & Rieckmann, 2016). Barth and Rieckmann (2016) analyzed 520 research papers and found that Europe leads in conducting most of the sustainability-related research (46.9%), followed by North America (23.7%), Oceania/Australia (14.6%), and Asia (8.5%). In Pakistani Context, very limited research, mainly from a curriculum perspective, have been carried out around SD (Kalsoom, 2017; Khanum, 2019; Bano et al., 2021). One of the most important factors in deciding to carry out this study is the

fact that very little previous research has been done about Sustainable Development and teaching styles. Only Kalsoom (2017) and Nousheen et al. (2020) conducted research on this very field of SC i.e., student-teachers' sustainability related knowledge, attitude, and behavior. However, these studies were limited to a specific subject and respondents. While the current study investigates the SC from a general perspective by including multiple subjects and respondents enrolled in teacher-education programs. Further, to the best of investigator information, no research has ever explored the teacher-educator teaching styles in perspective of student-teachers' SC. This represents a huge disparity in the amount of research at this critical area compared to the rest of the world.

1.3   Statement of the Problem

ESD encompasses teaching and learning that recognizes the interconnectedness of ecological, social, and economic systems. The field of education is constantly evolving, and with the growing concerns about the future of the world, it is crucial for educators to efficiently include sustainability themes via their teaching methods in their classrooms. ESD is an important aspect of education that is focused on developing the knowledge, skills, values, and attitudes that are necessary for sustainable development. It is an essential element of education that is based on the idea that students should be able to understand and appreciate the complex relationships between human activities and the natural environment.

Secondly, teacher-educators play a crucial role in shaping the future of education. They are responsible for providing the necessary guidance and training to student-teachers, and their teaching styles have a significant impact on the way student-teachers learn and develop. Thirdly, student-teachers are the future of education, and their sustainability consciousness is essential for the preservation of the environment

and the development of a more sustainable future. Therefore, it is important to understand the factors that influence the development of student-teachers' sustainability consciousness and how to promote it. Despite the increasing importance of sustainability in education, there is a gap in knowledge about the status of teacher-educators teaching styles, student-teachers' sustainability consciousness, and the role of teachers' teaching styles in developing student-teachers' sustainability consciousness in Pakistani context.

Many researchers have studied the relationship between teaching styles and students' traditional learning and academic achievement. However, the investigation of teaching style from the perspective of sustainability-related learning is the area that requires deliberation. This issue is relevant to the field of education and society because it highlights the need for more research on how to effectively integrate sustainability in teaching practices and develop sustainability consciousness among future teachers.

The integration of ESD in the educational system is crucial for achieving sustainability in the long-term. Teacher-educators and student-teachers are two key stakeholders in this process as they play a pivotal role in shaping the future of education. Teacher-educators are responsible for training the next generation of teachers while student-teachers may become future educators themselves. These two variables are crucial in determining the ability of future teachers to integrate sustainability in their teaching practices. Despite the importance of teacher-educators and student-teachers in the integration of ESD in educational settings, research pertaining to their teaching styles and sustainability consciousness in the Pakistani context is limited. This study aims to explore the teacher-educators' teaching styles, student-teachers' sustainability consciousness, and their relationship in Pakistan.

1.4   Study Objectives

The present research study's objectives are as follows.

1.   To investigate the perception of student-teachers about their teacher-educators' teaching styles.

2.   To explore the student-teachers' sustainability consciousness (SC).

3.   To explore the difference in the perception of student-teachers about their teacher-educator teaching styles based on demographic variables; age and gender.

4.   To investigate the difference in student-teachers' sustainability consciousness based on demographic variables; gender, age, academic programs, enrollment years and institutions.

5.   To examine the effect of teacher-educators' teaching styles on student-teachers' Sustainability consciousness.

1.5   Research Questions

The present research study's research questions are as follows.

1.   How do teacher-educators educate students about sustainable development while preparing them to become future teachers in the field of SD?

2.   What is the student-teachers' knowledge, attitude, and behavior about SD?

3.   How does the teaching style of teacher-educators contribute to the development of sustainability consciousness among student-teachers?

1.6   Null Hypotheses

Current research hypotheses are as follows:

H_01: There is no significant gender-based difference in student-teachers' perception about their teacher-educators' teaching styles.

$H_0$1a: There is no significant difference in student-teachers' perception about their teacher-educators' expert teaching style based on gender.

$H_0$1b: There is no significant difference in student-teachers' perception about their teacher-educators' formal authority teaching style based on gender.

$H_0$1c: There is no significant difference in student-teachers' perception about their teacher-educators' personal model teaching style based on gender.

$H_0$1d: There is no significant difference in student-teachers' perception about their teacher-educators' facilitator teaching style based on gender.

$H_0$1e: There is no significant difference in student-teachers' perception about their teacher-educators' delegator teaching style based on gender.

$H_0$2: There is no significant age-based difference in student-teachers' perception of their teacher-educator teaching styles.

$H_0$2a: There is no significant difference in student-teachers' perception about their teacher-educator expert teaching style based on their age.

$H_0$2b: There is no significant difference in student-teachers' perception about their teacher-educator formal authority teaching style based on their age.

$H_0$2c: There is no significant difference in student-teachers' perception about their teacher-educator personal model teaching style based on their age.

$H_0$2d: There is no significant difference in student-teachers' perception about their teacher-educator facilitator teaching style based on their age.

$H_0$2e: There is no significant difference in student-teachers perception about their teacher-educator delegator teaching style based on their age.

$H_0$3: There is no significant gender-based differences in student-teachers' sustainability consciousness.

$H_0$3a: There is no gender-based significant differences in student-teachers' environmental knowingness.

$H_0$3b: There is no gender-based significant differences in student-teachers' social knowingness.

$H_0$3c: There is no gender-based significant differences in student-teachers' economic knowingness.

$H_0$3d: There is no gender-based significant differences in student-teachers' environmental attitude.

$H_0$3e: There is no gender-based significant differences in student-teachers' social attitude.

$H_0$3f: There is no gender-based significant differences in student-teachers' economic attitude.

$H_0$3g: There is no gender-based significant differences in student-teachers' environmental behavior.

$H_0$3h: There is no gender-based significant differences in student-teachers' social behavior.

$H_0$3i: There is no gender-based significant differences in student-teachers' economic behavior.

$H_0$4: There is no age-based significant difference in student-teachers' sustainability consciousness.

$H_0$4a: There is no age-based significant difference in student-teachers' environmental knowingness.

$H_0$4b: There is no age-based significant difference in student-teachers' social knowingness.

$H_0$4c: There is no age-based significant difference in student-teachers' economic knowingness.

$H_0$4d: There is no age-based significant difference in student-teachers' environmental attitude.

$H_0$4e: There is no age-based significant difference in student-teachers' social attitude.

$H_0$4f: There is no age-based significant difference in student-teachers' economic attitude.

$H_0$4g: There is no age-based significant difference in student-teachers' environmental behavior.

$H_0$4h: There is no age-based significant difference in student-teachers' social behavior.

$H_0$4i: There is no age-based significant difference in student-teachers' economic behavior.

$H_0$5: There is no significant difference in the sustainability consciousness of student-teachers based on their enrollment in various academic programs.

$H_0$5a: There is no significant difference in the environmental knowingness of student-teachers based on their enrollment in various academic programs.

$H_0$5b: There is no significant difference in the social knowingness of student-teachers based on their enrollment in various academic programs.

$H_0$5c: There is no significant difference in the economic knowingness of student-teachers based on their enrollment in various academic programs.

$H_0$5d: There is no significant difference in the environmental attitude of student-teachers based on their enrollment in various academic programs.

$H_0$5e: There is no significant difference in the social attitude of student-teachers based on their enrollment in various academic programs.

$H_0$5f: There is no significant difference in the economic attitude of student-teachers based on their enrollment in various academic programs.

H05g: There is no significant difference in the social behavior of student-teachers based on their enrollment in various academic programs.

$H_0$5h: There is no significant difference in the environmental behavior of student-teachers based on their enrollment in various academic programs.

$H_0$5i: There is no significant difference in the economic behavior of student-teachers based on their enrollment in various academic programs.

$H_0$6: There is no significant difference in the student-teachers' sustainability consciousness based on year of the study.

$H_0$6a: There is no significant difference in the student-teachers' environmental knowingness based on year of the study.

$H_0$6b: There is no significant difference in the student-teachers' social knowingness based on year of the study.

$H_0$6c: There is no significant difference in the student-teachers' economic knowingness based on year of the study.

$H_0$6d: There is no significant difference in the student-teachers' environmental attitude based on year of the study.

$H_0$6e: There is no significant difference in the student-teachers' social attitude based on year of the study.

$H_0$6f: There is no significant difference in the student-teachers' economic attitude based on year of the study.

$H_0$6g: There is no significant difference in the student-teachers' environmental behavior based on year of the study.

$H_0$6h: There is no significant difference in the student-teachers' social behavior based on year of the study.

$H_0$6i: There is no significant difference in the student-teachers' economic behavior based on year of the study.

$H_0$7: There is no significant difference in the sustainability consciousness of student-teachers' studying in various educational institutions.

$H_0$7a: There is no significant difference in the environmental knowingness of student-teachers' studying in various educational institutions.

$H_0$7b: There is no significant difference in the social knowingness of student-teachers' studying in various educational institutions.

$H_0$7c: There is no significant difference in the economic knowingness of student-teachers' studying in various educational institutions.

$H_0$7d: There is no significant difference in the environmental attitude of student-teachers' studying in various educational institutions.

$H_0$7e: There is no significant difference in the social attitude of student-teachers' studying in various educational institutions.

$H_0$7f: There is no significant difference in the economic attitude of student-teachers' studying in various educational institutions.

$H_0$7g: There is no significant difference in the environmental behavior of student-teachers' studying in various educational institutions.

$H_0$7h: There is no significant difference in the social behavior of student-teachers' studying in various educational institutions.

H_07i: There is no significant difference in the economic behavior of student-teachers' studying in various educational institutions.

H_08: There is no significant effect of teacher-educator teaching style on student-teacher Sustainability consciousness.

H_08a: There is no significant effect of expert teaching style on student-teachers' sustainability knowingness.

H_08b: There is no significant effect of expert teaching style on student-teachers' sustainability attitude.

H_08c: There is no significant effect of expert teaching style on student-teachers' sustainability behavior.

H_08d: There is no significant effect of formal authority teaching style on student-teachers' sustainability knowingness.

H_08e: There is no significant effect of formal authority teaching style on student-teachers' sustainability attitude.

H_08f: There is no significant effect of formal authority teaching style on student-teachers' sustainability behavior.

H_08g: There is no significant effect of personal model teaching style on student-teachers' sustainability knowingness.

H_08h: There is no significant effect of personal model teaching style on student-teachers' sustainability attitude.

H_08i: There is no significant effect of personal model teaching style on student-teachers' sustainability behavior.

H_08j: There is no significant effect of facilitator teaching style on student-teachers' sustainability knowingness.

H_08k: There is no significant effect of facilitator teaching style on student-teachers' sustainability attitude.

H_08l: There is no significant effect of facilitator teaching style on student-teachers' sustainability behavior.

H_08m: There is no significant effect of delegator teaching style on student-teachers' sustainability knowingness.

H_08n: There is no significant effect of delegator teaching style on student-teachers' sustainability attitude.

H_08o: There is no significant effect of delegator teaching style on student-teachers' sustainability behavior.

1.7 Conceptual framework

Antony F. Grasha (1996) teaching styles' model and Gericke et al (2018) sustainability consciousness model provides the framework for the current study. The current study is predicated on the idea that teacher-educator teaching styles may be a crucial catalyst for the development of the student-teachers' sustainability consciousness.

1.7.1 Teaching styles Model

Anthony F. Grasha introduced a comprehensive model for teaching styles in 1996. According to Grasha, each teacher has unique preferences in teaching and student learning, which can be compared to the colors on an artist's palette. One color is usually dominant in the artwork, just as one teaching style is dominant in a teacher's instruction. This dominant style sets the teacher apart from others. This model, known as Grasha's model, is based on philosophical ideas about teaching and has been widely used in education around the world, including in Taiwan, Iran, Pakistan, Saudi Arab, Turkey,

and Japan. Education professionals have found Grasha's model to be a useful tool for categorizing the teaching styles of higher education instructors (Heydarnejad et al., 2021; Soleimani, 2020). It has been utilized in numerous studies around the world, for example in Iran (Ghorbanzadeh, 2022; Heydarnejad et al., 2021; Soleimani, 2020; Fadaee et al., 2021), Pakistan (Ahmed et al., 2021), Japan (Toyama, & Yamazaki, 2020) Saudi Arabia (Alnujaidi, 2019), and Turkey (Durmus & Güven, 2020). Mazloom and Hussain (2020) also note that Grasha's model has been widely utilized in the field of education around the world. Grasha' teaching style inventory has also been utilized in in order to assess the teacher-educators teaching styles (Amirian et al., 2022; Soleimani, 2020).

According to Grasha's model, each teacher has a preferred approach to teaching and student learning. He compared these styles to the colors on an artist's palette, with one color being dominant in the resulting artwork. Similarly, a teacher may use a variety of teaching styles in their instruction, but one style is typically more prominent. This dominant style sets the teacher apart from others. Grasha identified five types of teaching styles

Grasha (1996) identified five types of teaching styles, one of which is the Expert style. Teachers with this style have a wealth of subject knowledge and strive to maintain a higher status in the classroom by showcasing their expertise and giving challenging assignments. The main objective of this style is to impart knowledge and help the students become knowledgeable and competent individuals. Grasha (1994) described another teaching style, the Formal Authority style, where the teacher has a high standing in the classroom due to their position as an educator and their deep subject knowledge. The teacher plays a crucial role in setting standards for student behavior, providing

feedback, and establishing learning goals. This style gives the teacher complete control and authority over the instructional process.

Grasha and Yangarber-Hicks (2000) also discussed the Personal Model style of teaching, where the teacher emphasizes leading by example in the classroom. The teacher serves as a role model, demonstrating appropriate thinking and behavior for the students to follow. It is expected that the students will adopt the teacher's methods. Learning is achieved through observation and hands-on activities. The authors also pointed out that traditional teaching methods can result in dependent students. Grasha (1996) also described the Facilitator style of teaching, where the focus is on interaction between the teacher and students. The students are encouraged to actively participate and take responsibility for their tasks. The teacher provides guidance by asking questions, assisting with decision making, and informing the students of their options. The focus is on the students' individual needs, and they are encouraged to explore alternative solutions. This style aims to promote independent thinking and learning through inquiry-based activities and student-teacher interactions. Grasha (1994) also identified the Delegator style of teaching, where the teacher delegates authority to the students. Students have the freedom to choose activities and work independently. The teacher is available for support when needed. This approach empowers students and helps them develop a sense of self-efficacy in their learning.

1.7.2 **Sustainability Consciousness Model**

The origin of Sustainability consciousness can be traced in the larger concept of SD, which comprises of three main pillars; economy, environment, and society (Ciegis et al., 2009; Harris, 2000). According to Kalsoom (2017), pro-environmental consciousness is a simple concept as compared to SC, for the reason that SC can be regarded as a complex inter-relation between attitude, knowledge, and behavior in main

areas of SD. SC refers to an awareness or perception of sustainability issues. These consist of one's unique experiences and perspectives, including ideas, attitudes, and actions (Gericke et al., 2018, p. 3). SC is referred to as the knowledge, attitude, and behavior towards the three dimensions of sustainable development. The three dimensions of sustainable development are environment, economy and society. SC has three main dimensions i.e., sustainability knowledge, sustainability attitude, and sustainability behavior, and nine sub-dimensions i.e., environmental knowingness, social knowingness, economic knowingness, environmental attitude, social attitude, economic attitude, environmental behavior, social behavior, economic behavior. Sustainability knowledge refers to the knowledge about the social, environmental, and economic issues pertinent to SD. Similarly, Sustainability attitude refers to the individual thinking about the social, environmental, and economic issues pertinent to SD, and Sustainability behavior refers to the individual indulgence in the sustainability related behavior including social, environmental, and economic initiatives to contribute towards betterment of the society.

1.7.3 Teaching Styles and Sustainability Consciousness

The Sociocultural Learning Theory and the Theory of Instruction provide a framework for understanding the relationship between teacher-educators' teaching styles and student-teachers' sustainability consciousness and the impact of these factors on the learning process. The Sociocultural Learning Theory suggests that learning is a social process that takes place in a cultural context and is shaped by the interactions between individuals and the environment. This theory proposes that students learn from the models and behaviors of their teachers, as well as from their experiences in the classroom. In the context of this study, the Sociocultural Learning Theory provides a basis for understanding the role of teacher-educators' teaching styles in shaping student-

teachers' attitudes and behaviors towards sustainability. The Theory of Instruction proposes that the teaching style of teacher-educators can have a significant impact on the learning outcomes of student-teachers. This theory suggests that effective teaching styles engage students, promote critical thinking, and facilitate the transfer of knowledge from the teacher to the student. In the context of this study, the Theory of Instruction provides a basis for examining the effectiveness of different teaching styles in promoting student-teachers' sustainability consciousness.

The effectiveness of various teaching styles on enhancing students' sustainability consciousness has been studied by researchers worldwide (Sterling, 2010, Nousheen et al., 2022). For instance, Sterling (2010) highlights the role of transformative pedagogies in fostering sustainability consciousness. Transformative pedagogies engage students in critical reflection, questioning, and dialogue, leading to a deeper understanding of complex sustainability issues (Kalsoom and Khanam, 2017). These approaches can help students develop critical thinking skills and examine their values, beliefs, and attitudes towards sustainability (Mezirow, 2000).

The impact of teaching styles on sustainability consciousness can be substantial, with different approaches affecting various dimensions of sustainability consciousness to varying degrees. Kalsoom (2017) found that preservice teachers achieved higher scores on the knowledge index of the SC-scale and lower scores on the behavior index when implementing an inquiry-based pedagogical approach to teach sustainability-related concepts. In a subsequent study, Kalsoom et al., (2022) showed that transformative pedagogies foster student awareness of environmental issues, subsequently shaping their attitudes and behavior towards sustainable development. Malandrakis (2022) examined the effectiveness of ESD pedagogies on prospective teachers' SC. The study's findings revealed that field visits, accompanied by

worksheets, activities, and concept maps were the most influential factors in enhancing preservice teachers' SC. In a similar vein, Svoboda and Whalen (2017) argued that group discussion, as an instructional technique, has considerable effects on students' attitudes and behavior. Wankel & stoner (2009) discussed the effectiveness of artwork as teaching strategy on individual understanding for SD. According to their research, art activities foster a sense of contribution among students towards sustainability (p.130). Furthermore, Lestari et al., (2022) conducted an experimental study to evaluate the impact of ESD on students' SC. Their findings suggest that classroom discussions and readings centered on SD themes significantly influence students' SC.

The literature emphasizes the utilization of various teaching styles for student learning in order to take informed decisions in a complex world. In addition to the aforementioned teaching styles, a more holistic approach to teaching sustainability may be necessary to address the complex and interdisciplinary nature of sustainability issues (Segalàs et al., 2010). Integrating different teaching styles and strategies, such as interdisciplinary learning (Warburton, 2003)., project-based learning (Wiek et al., 2014), and service-learning (Barth et al., 2014) can provide students with a more comprehensive understanding of sustainability and its interconnected dimensions (Warburton, 2003). These approaches can also help students develop a wide range of skills and competencies, such as systems thinking, ethical reasoning, and decision-making, which are crucial for addressing sustainability challenges (Wiek et al., 2011).

Expert teaching styles may be less effective in developing students' sustainability-related attitudes and behaviors due to their focus on the transmission of knowledge from the teacher to the student and the passive role students often assume in the learning process (Barron & Darling-Hammond, 2008). This approach may limit students' engagement with the material, as it does not actively involve them in

exploring or making connections with sustainability-related concepts (Cotton, 2006).

Developing sustainability consciousness requires not only factual knowledge but also

the ability to reflect on one's own values, beliefs, and actions in relation to sustainability

issues (Rieckmann, 2017). Expert teaching styles, with their emphasis on content

delivery, may not provide sufficient opportunities for students to engage in the kind of

active learning, critical thinking, and personal reflection necessary to foster these

attitudes and behaviors (Barron & Darling-Hammond, 2008). In contrast, more

interactive and student-centered approaches, such as constructivist, facilitator, and

delegator teaching styles, have been found to be more effective in promoting

sustainability consciousness, as they encourage active learning and personal

connections to the material (Cotton, 2007; Cotton et al., 2010, Heimlich & Norland,

2002).

Figure 1.1.

Conceptual Framework
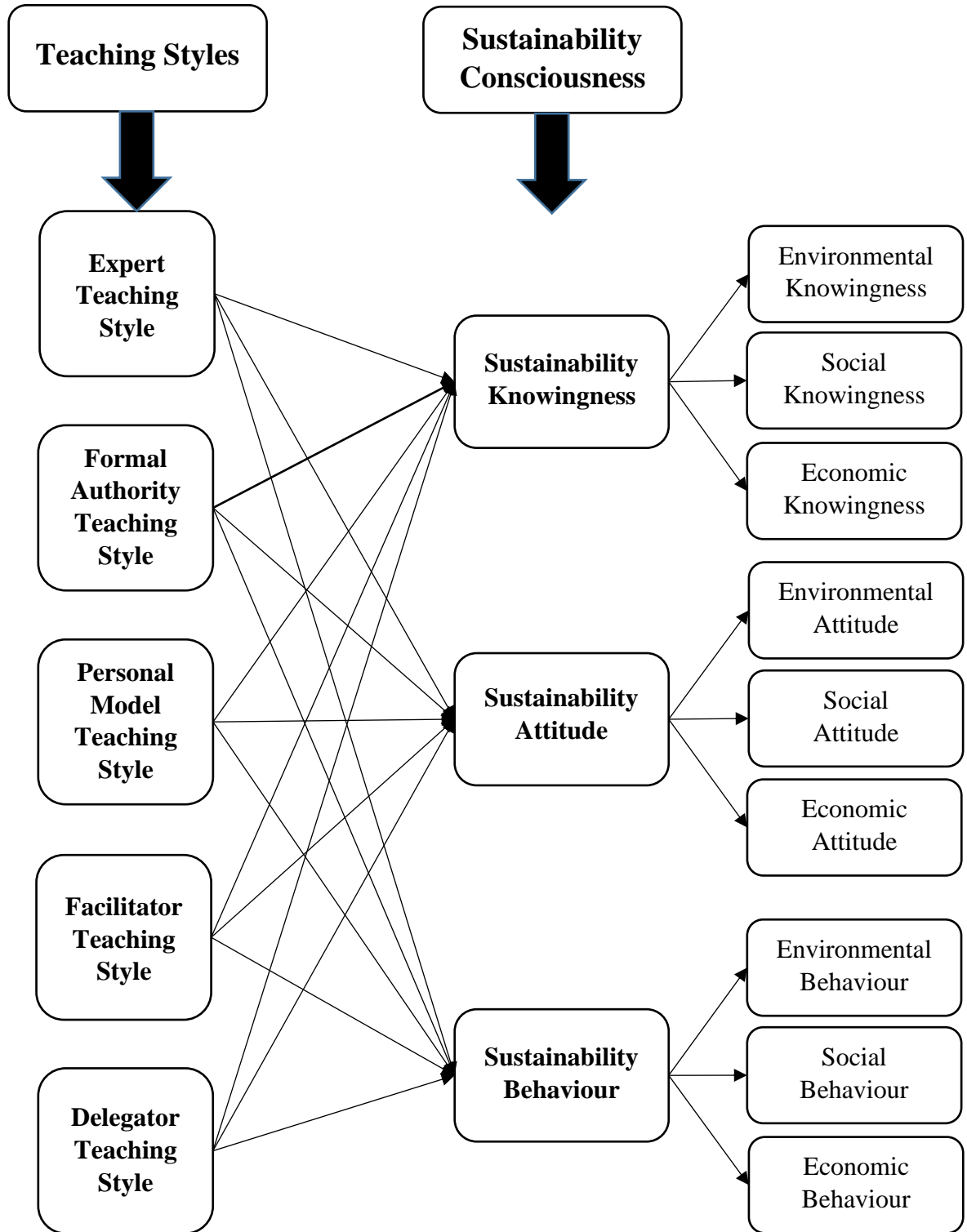
1.8   Operational Definitions

1.8.1   Sustainable development

Sustainable development refers to a development approach that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

1.8.2   Education for sustainable development

Education for sustainable development (ESD) is an educational approach that aims to equip individuals with the knowledge, skills, and attitudes necessary to understand and address global challenges such as poverty, ecological degradation, and social inequality. It seeks to foster critical thinking, creativity, and problem-solving abilities while promoting democratic values, social justice, and environmental stewardship. ESD empowers individuals to make informed decisions and take responsible actions that contribute to a more sustainable and equitable future for all.

1.8.3   Teacher-educators

Teacher-educators refer to individuals who are involved in the education and preparation of both future and current teachers. This includes those who provide formal education programs to teacher candidates and those who provide ongoing support and professional development to practicing teachers.

1.8.4   Student-teachers

Student-teachers, also known as prospective teachers or pre-service teachers, are college, university, or graduate students who are pursuing an education degree and are engaged in teaching practice under the supervision of qualified teachers.

1.8.5 **Teaching styles**

Teaching styles, also known as teaching approaches, refer to the different ways in which educators tailor their content, methods, and interactions to meet the needs of individual learners. It includes how teachers convey information, interact with students, manage classroom activities, guide student development, and encourage student participation.

1.8.6 **Consciousness**

Consciousness refers to the state of being aware and the capacity for self-awareness and internal perception of a particular object or state.

1.8.7 **Sustainability Consciousness**

Sustainability consciousness refers to the awareness and understanding of the need for sustainable development and the adoption of sustainable practices. It involves individuals and organizations making conscious decisions and taking actions to reduce their environmental, social, and economic impact and contribute to a more sustainable future.

1.8.8 **Sustainability knowingness**

Sustainability knowledge refers to the understanding, awareness, and comprehension of the principles and practices of sustainability, as well as the scientific, social, and economic aspects of sustainability. It includes knowledge of the interrelationships between the environment, society, and economy and the impact of human activities on these systems.

1.8.9 **Sustainability attitude**

Sustainability attitude refers to an individual's beliefs, values, and opinions about environmental, social, and economic issues and the importance of addressing these issues for future generations. It encompasses an individual's willingness to take action to promote sustainability and make changes in their own life, as well as a belief in the importance of collective action to address sustainability challenges.

1.8.10 **Sustainability behavior**

Sustainability behavior refers to the actions and choices individuals make in their daily lives that prioritize environmental conservation, social well-being, and economic responsibility, aiming to create a more sustainable future. It involves conscious decision-making to minimize negative impacts and actively contribute to sustainable practices.

1.9 Significance of the Study

This research is one of the few projects on ESD in Pakistan and the first to study the teaching styles of teacher-educators for teaching SD and their relationship with student-teachers' student-teachers' sustainability outcomes, i.e., SC. This research contributes to the corpus of knowledge about ESD, sustainability, sustainability education, teacher education, teaching styles/pedagogies, and student-teachers' SC. The importance of this research cannot be overstated as it addresses a vital aspect of teacher education, which is the preparation of future teachers to promote sustainability in their classrooms. Sustainability education is becoming increasingly important as the world faces a range of environmental, social, and economic challenges, and it is essential that future teachers are equipped with knowledge, skills, and attitudes necessary to address these issues in their classrooms.

One of the main research objectives is to investigate the perception of student-teachers about their teacher-educators' teaching styles. Understanding these styles is essential for identifying effective pedagogical approaches to prepare future teachers. Another key objective of this study is to explore student-teachers' sustainability consciousness. Sustainability consciousness is a critical aspect of sustainability education. Understanding the sustainability consciousness of student-teachers can provide valuable insights into the effectiveness of current teacher-education programs and inform the development of new programs. The study also aims to explore the difference in perception of student-teachers about their teacher-educator teaching styles based on age and gender. Examining demographic differences in student-teachers' perceptions of teaching styles can provide valuable insights into how different groups of students respond to different teaching styles. Furthermore, the study investigates the difference in student-teachers' sustainability consciousness based on demographic variables such as gender, age, academic programs, enrollment years, and institutions. This will allow to identify if there are any trends or patterns of difference in student-teachers' sustainability consciousness across different demographic groups.

The study aims to examine the effect of teacher-educators' teaching styles on student-teachers' sustainability consciousness. The findings can inform the design of teacher education programs that effectively promote sustainability in classrooms. The study findings will assist teachers to understand the effectiveness of various teaching styles in promoting SD and enhancing students' knowledge, attitude, and behavior (KSA) toward SD.

Overall, this research contributes significantly to teacher education and sustainability education. It improves future teacher training, informs policy decisions, and promotes sustainability consciousness. It also serves as a model for future research

in this area. The practical significance lies in providing valuable insights into teacher-educators' teaching styles and their impact on student-teachers' sustainability consciousness. The findings can guide curriculum designers and planners in enhancing curricula. Policymakers may also find the study useful in emphasizing the importance of SD in teacher education, benefiting students, teachers, administrators, educational leaders, policymakers, and society as a whole.

1.10 Methodology

1.10.1 Study design

The fundamental objective of the current research is to study the teacher-educators teaching styles and student-teachers' SC concerning ESD. The study utilized the convergent parallel mixed methods design to conduct the research study.

1.10.2 Study population

Total nineteen hundred and eighty-six student-teachers enrolled in seven public sector institutions of Rawalpindi and Islamabad region comprised the study population. The entire selected individual were the students' teachers' undergraduate programs.

1.10.3 Research Sample

This study's sample was chosen using a stratified random sampling procedure. A total of nine hundred and ninety-three students that made up 50 percent of the sample was drawn at random from the overall population.

1.10.4 Research instruments

The current study utilized Teaching Styles questionnaire adapted by the researcher in perspective of student-teachers based on Grasha's Teaching Style Inventory (1996) and the sustainability consciousness questionnaire adapted by

researcher rooted in Gericke et al. (2019) framework. To get a deep insight into the variable under study, the current research utilized a semi-structured interview technique. The interview protocols were prepared after a comprehensive literature review.

1.10.5 **Data collection**

The current research utilized a mix-method approach for data collection i.e., for collecting quantitative information research questionnaires were applied, whereas semi-structured interviews were held for qualitative data.

1.10.6 **Data analysis**

Descriptive analysis, t-test, ANOVA, Exploratory Factor Analysis (EFA), Partial Least Square Structural Equation Modelling (PLS-SEM) used to test the research hypotheses. While thematic analysis was performed for qualitative data coding. All the techniques were used through applying software SPSS and NVivo.

1.11 Delimitations

1. The participants of the research study were limited to student instructors who were enrolled in four-year BS and B.Ed. (Hons) programs.

2. This study was conducted in twin cities of Rawalpindi and Islamabad.

3. Only public sector institutions were selected due to time and budget constraints.

4. The teaching styles were explored of those teachers who were teaching the subjects of (Pakistan studies, the teaching of social studies, environmental education, and contemporary trends and issues in education).

CHAPTER 2

LITERATURE REVIEW

The goal of this research was to investigate the teaching styles of teacher-educators, student-teachers' SC and how well a certain teaching style works at fostering in students' knowledge about, attitude toward, and action toward SD. This chapter discusses the theoretical underpinnings of SD, the concepts of SD and Education for SD, teaching styles, and the contribution of teaching styles to student learning about SD. Moreover, the earlier studies on study variables are also included in this chapter. The researcher attempted to explore the association between teaching styles and SC.

2.1 Movement of Sustainable development

The concept of sustainable development (SD) was first discussed in the mid-1970s due to concerns that planet resources could not be sustained in an industrialized society if development continued at its current pace. The roots of the term "sustainable development" can be traced back to Thomas Robert Malthus's 1798 Essay, "Principle of Population," in which he argued that continuous population growth would eventually lead to "starvation" as the balance between food consumption and population growth could not be maintained (Bruffee, 1973; Papenfuss et al., 2019; Paul, 2008). The publication of 'The Limits to Growth' by the Club of Rome in 1972 also raised the challenge of scarcity of non-renewable resources and the potential for global challenges if industrial growth continued unaltered (Meadows et al., 1972). The United Nations' "human environment" conference held in Stockholm in the same year resulted in the formation of the United Nations Environmental Program (UNEP) (Paul, 2008).

In 1983, the United Nations General Assembly established the World Commission on Environment and Development (also known as the Brundtland

Commission) with an agenda for global transformation. The first global forum on SD was held at the 'Earth Summit' in Rio in June 1992 and was attended by 10,000 representatives from 178 nations. The United Nations organized another conference entitled "our common future" in Rio de Janeiro focused on reorienting and integrating education for sustainable development (ESD) more effectively (Kalsoom, 2017).

In 2015, the United Nations proposed the "Transforming our world: the 2030 Agenda for Sustainable Development" to address major challenges related to the planet, people, prosperity, partnership, and peace. The Agenda 2030 was adopted unanimously by 193 countries and has 17 goals and 169 targets, including Goal 4: "Quality and Inclusive Education" which is one of the most crucial in terms of education. Target 4.7 is focused on "Education for Sustainable Development," aimed at providing students with the knowledge and skills necessary to support SD.

2.2   Concept of Sustainable Development

The concept of sustainable development (SD) was first introduced in the Brundtland UN report in 1987. Since then, the definition of SD has been refined and redefined by various organizations, experts, and researchers. As Ciegis et al. (2009) noted, the complexity of the SD concept can be classified into four areas: contextual, conceptual, geopolitical, and academic. This highlights the significance of context in shaping the definition of SD. Khanum (2019, p. 38) argued that the term "sustainable development" is ambiguous, as different researchers have defined it in varying ways. This diversity in definitions is attributed to the contextual issues surrounding SD (Khanum, 2019, p. 38). According to Borowy (2013), SD refers to a lifestyle that prioritizes healthy living conditions for a long period of time. It involves the planning of an economic and social system that ensures the sustainability of key goals, such as quality education, good health, and improvement of quality of life (Pearce et al., 2013).

Sterling (2010a) defined SD as a balance between the economy and the environment along a new development path that supports human growth globally and over the long term. Marin et al. (2012) described SD as the ability of a system or society to function continuously in a pre-determined future without depletion of resources.

McKeown and Nolet (2013, p. 6) defined SD as a thinking paradigm that aligns social, economic, and environmental concerns for the future. This paradigm is built on the foundation of human rights and dignity. According to Baumgartner (2011), SD is an initiative aimed at transforming society from unsustainable to sustainable practices. Holden et al. (2017) defined SD as a normative moral system based on the moral imperatives of human needs, social equality, and environmental protection. This system provides ethical and moral guidelines for individuals to follow in their pursuit of SD.

Although the concept of sustainable development is widely discussed and studied, it still remains a controversial and challenging issue (Cotton et al., 2007). One of the major criticisms of SD is the lack of consensus on a clear definition and the ambiguity of the term, as discussed by Khanum (2019). This uncertainty can lead to misunderstandings and differences in interpretation among stakeholders, resulting in difficulties in implementation and achieving the goals of SD (Leal Filho, 2000). Sterling (2010a) highlighted another challenge that is the tension between economic growth and environmental protection. Balancing the two can be difficult and often requires trade-offs. Additionally, there may be conflicting interests between different countries, communities, and industries, making it difficult to reach agreements on the best approach to SD (Shrivastava & Guimarães-Costa, 2017).

In addition, there are concerns about the implementation of SD, including a lack of political will, insufficient resources, and limited capacity among developing countries (Akenroye et al., 2018). This can result in unequal distribution of the benefits

and drawbacks of development, exacerbating existing social inequalities. Finally, there are debates about the ethical and moral implications of SD, as discussed by Holden et al. (2017). Some argue that certain development practices that prioritize economic growth over environmental protection are morally and ethically wrong (Wesselink & Wals, 2011). These controversies and challenges highlight the need for continued discussions and efforts to improve and clarify the concept of sustainable development.

2.3   Education for Sustainable Development

The term ESD has been defined as a vision, a process or theme, and a set of values (Kalsoom, 2017, p. 26). The implementation of ESD began in 2005, when the UN passed a resolution to implement the Decade of Education for Sustainable Development (DESD) from 2005 to 2014. This initiative has been considered a global effort to make ESD a key contributor to sustainable development (SD) (Michelsen & Wells, 2017). The ESD is equally significant for both developed and developing nations. ESD is an effort that enables society, institutions, and individuals to view the future as shared, not belonging solely to any one group (UNESCO, 2005). The concept of ESD emerged from the recognition of the importance of education in addressing environmental, economic, and social issues that the earth has been facing. Therefore, sustainability education must change learners' attitudes and behaviors towards a more sustainable world (UNESCO, 2014c). ESD helps the individual to change the attitude and knowledge towards a more sustainable society. It aims to empower the future generation to fulfill their needs utilizing an integrated and balanced approach for social, environmental, and economic development (Alexander Leicht et al., 2018). Tang (2018) argues that attitudinal and behavioral change among future generations requires continuous efforts from teachers and institutions. Furthermore, the effectiveness of

ESD in creating attitudinal and behavioral change among future generations remains uncertain, as it requires continuous efforts from teachers and institutions (Tang, 2018).

McKeown et al. (2002) proposed that ESD consists of four components: identifying and understanding sustainability-related issues, motivating people to adopt sustainable lifestyles, engaging their participation as citizens in a democratic society, and living sustainably. However, the implementation of these components remains challenging, as there is limited empirical research to support their effectiveness in promoting sustainable development. McKeown et al. (2002) also emphasized that ESD programs should identify local economic, environmental, and social problems in order to identify innovative solutions in local contexts. ESD aims to transform the education system, which will in turn help societies achieve a sustainable future (Buckler & Creech, 2014). It is a transformative learning process that provides students and teachers with the knowledge and skills needed for more sustainable development and promotes the way of thinking required for environmental, economic, and social development (Cloud Institute for Sustainable Education, 2016). ESD also faces criticism for failing to address systemic issues, such as economic and political structures, that underlie unsustainable development (Buckler & Creech, 2014; Wesselink & Wals, 2011). Moreover, transforming the education system is a complex and long-term process that requires significant resources and political will (Sachs et al., 2019).

ESD educates students in the knowledge, abilities, morals, and perspectives necessary for a sustainable future and involves incorporating key SD topics into the educational process, such as reducing poverty, mitigating global warming, protecting biodiversity, and promoting sustainable consumption (Leicht et al., 2018, p. 35). According to UNESCO (2014c), "ESD is a potential and an obligation that should

involve both developing and developed countries in stepping up efforts for eradicating poverty, reducing inequality, promoting ecological sustainability, and economic growth to benefit all countries."

ESD aims to transform individual thinking, as a change in thinking leads to changes in action (Sipos et al., 2008). Tedesco et al. (2014) identified the following sub-themes in ESD: ICT, gender disparity, human rights, values education, environmental education, and civic education. They noted that environmental education is the most frequently used topic in school curricula. ESD involves incorporating important sustainability-related topics into teaching and learning, such as global warming, disaster prevention, biodiversity, poverty alleviation, and sustainable consumption. It requires the use of active learning and teaching techniques that motivate and prepare students to change their behavior and take action to support SD. ESD also develops critical thinking skills and helps students make informed decisions (UNESCO, 2012b).

Students who study sustainability are better equipped to address the problems threatening the long-term sustainability of our planet (Boud, 2000; Frisk & Larson, 2011). Learning about sustainability enables and assists students in making decisions that promote SD. The purpose of ESD is to support the development of education in order to reorient society toward sustainability (Hopkins & McKeown, 2002). In simple words, SE (sustainability Education) can be defined as ESD (Taimur, 2020).

2.4 Theoretical Underpinnings

Following are the learning theories that provide theoretical support to conduct the study.

2.4.1 **Sociocultural Learning Theory and Theory of Instruction**

Numerous scholars have contrasting and sometimes opposing opinions about the question of whether learning encourages potential growth (Anderson & D'Ambrosio, 2008) or if developmental phases guide learning (Piaget, 1970). Even more viewpoints exist on the ways in which individual truly learn. While some theorists assert that learning happens in discrete situations aided by conditioning (Pavlov, 1927), others contend that learning is truly guided by natural internal growth (Piaget & Inhelder, 1939). Similarly, Dewey (1938) stated that children learn through experience, and they formulate new knowledge by applying their previous knowledge and experience to a new experience. In contrast to the Dewey's idea of experiential learning, Gagne (1985) argued that children learning is a multi-level concept and learning new skills and knowledge requires planned and structured pedagogical/instructional interventions. There are several ideas on whether learning is just determined by how much time is spent studying or if it is also influenced by external variables like the environment or social interactions (Skinner, 1953). According to Vygotsky's (1930) theory of cognitive development, learning is based on innate developmental phases that are comparable to those described by Piaget (1970). Vygotsky's constructivist viewpoints and ideas on the processes of child development were shared by Piaget (1970) and Bruner (1985), who also shared this viewpoint. The Social Development Theory of Vygotsky (1930) was complemented by Bandura's Social Learning Theory in 1977. If humans were to exclusively rely on the results of their own activities to guide their judgements, Vygotsky would have concurred with Bandura that learning would be extraordinarily difficult, not to mention dangerous (Bandura, 1977, p. 22). The social-historical context was a particular area of focus for Vygotsky (1930) as he developed his integrated theory. Despite the fact he agreed to the idea that traditional

internal developmental indicators like imitation and intrinsic curiosity foster cognitive developmental progress, he posited that these traits by themselves could not lead a person through advanced and complex problems.

Vygotsky (1935) started to investigate child behavior in greater detail and focused on student performance in addition to instructional techniques. Vygotsky noticed that with a minimal assistance, individual can perform at higher cognitive levels when receiving guided instruction. In one cited case, Vygotsky described a circumstance in which two students who were performing at the same academic level separately excelled at noticeably greater levels when offered help with a more challenging topic. This occurrence showed Vygotsky that a student's future cognitive growth depends not just on their degree of innate ability but also on how well they can function when given support. The difference between a learner actual and potential level of performance was first assessed by him in 1930, and he referred it to as the ZPD. Vygotsky suggested that the ZPD may help children prolong their cognitive development by allowing them to combine their intrinsic skills and knowledge with social cues and interactions. Vygotsky thought that guidance of more experience individual often helped students develop more than they would have otherwise, independent of guidance. In order to ascertain the degree of contact between fundamental development and socio-cultural impacts, Vygotsky recommended educators to conduct further research in this area. Modern educators concur that the learning process of students is influenced by an interaction between natural development and external stimuli, but they disagree on the precise significance of such interactions.

The teacher's contribution to enhancing a child's learning capacity was highlighted by Vygotsky's ZPD idea. His observational study from 1930 gave

academics in the future the data they needed to examine teaching styles. The ZPD hypothesis was backed by Vygotsky's (1935) example of a child who first learned to walk by hanging onto an adult's hand even though the child was unable to walk alone. The example of an adult leading a kid's steps before the child was developmentally ready can be used by teachers to draw similar conclusions about other connections between cognitive and internal development. The ZPD therefore has direct relevance to the interactions between instructors and students, and it offers adequate rationale for teachers to initiate knowledge beyond students' existing performance levels.

The ZPD hypothesis may also be applied to contemporary educational environments, showing that instructors' instructional strategies can encourage pupils to think conceptually and abstractly. Teachers might challenge pupils to think critically about newly emerging learning practices. Student thinking will be pushed and perhaps the learning will be extended when the instructor asks them to dig deeper. Similar to this, the ascents and descents of a stairway were compared by Bruner (1966) to the cognitive development. Concepts ultimately develop and go on to the next level of learning when the learner's knowledge is fostered. Instead of emphasizing a student's level of preparation to learn, Bruner (1966) thought that every learner has the capacity to climb the learning staircase, but that external factors, such as instructional style, might halt, delay, or accelerate the learning process.

Vygotsky's claimed that a pupil' development and progress is associated and supported with a variety of internal and external factors, however, the external factors have significant impact on individual learning. Bruner (1966) also claimed in his theory that learning is sensitive by nature and students are open to a variety of instructional approaches. Each individual has multitude of learning strategies on hand; however, the teacher has the most important role in helping learner to achieve fullest potential. In

contrast, a teacher who can help children reach their potential could simultaneously fall short of giving them opportunity to develop sophisticated mental processes. According to Bruner (1985), some educational settings may be to blame for pupils developing permanent learning deficiencies. According to Bruner (1966), these possible learning deficiencies could already exist before a student enrolls in a formal educational institution. The teacher students are important and has lifelong impacts, regardless of whether the educator is a parent or a professional instructor. It is anticipated that whatever information or skills that the students lack will be acquired via some sort of "interaction" or procedure in the classroom. Teaching is referred to as any interaction or process intended to transmit knowledge or skills. It may be disguised as a "learning activity" and planned such that the teacher is not directly involved in imparting a particular skill or information, but rather engages in activity intended to have a particular impact on the learner's mind. In terms of practices and pragmatics, "teaching" is everything that the instructor does that is meant to cause a change in the learner's repertoire and behavior. Teaching is the process that adheres to the guidelines set out by the curriculum. The connection is straightforward: all of the new information and abilities outlined in the curriculum must be taught to the pupils. Students wouldn't have certain information and abilities prior to the instructor teaching them. The procedure that created the distinct changes in student learning (knowledge, attitude, and behavior) took place between the two parties during the interaction.

Bruner (1966) stated that in the context of instruction, there is always a unique issue of authority since this is a relationship between those who possess something and those who do not. The student learning largely depends on the way in which this authority relationship is handled. Learning is always impacted by the relationship between the person instructing and the person being instructed. Bruner's observation

may perhaps be even more pertinent given the current educational conundrum (debating the best strategies and tactics for bringing students up to date). According to Bruner (1966), the contemporary development required redefining education constantly.

According to Bruner (1966), how instructors present their lessons affects how successfully pupils master a body of knowledge. Bruner recommended teachers to avoid interfering with their pupils' ability to direct their own learning (Bruner, 1966). Grasha (1996) also emphasized the significance of relationships between educators and pupils in the learning process. Relationships between instructors and students, as well as the effectiveness of those interactions in both directions, remain critical to student learning. According to Grasha (1996), pupils grow as a result of changes in teacher-student views of one another, their behavior toward one another, and the mutual exchanges innate in their interactions. According to Bruner, communication between students and instructors can periodically slow or even totally cease the learning process. This might lead to students relying completely on instructors for educational assistance (Bruner, 1966).

2.4.2   Critical Social Learning

The roots of critical social theory may be traced to Frankfurt School. The basic goal of critical social theory is to increase knowledge emancipatory function. The extensive body of research on critical social theory emphasizes the necessity of critique in defining a high-quality educational experience. Additionally, it emphasizes the role of theory in critical education as the intellectual underpinning of practice rather than as a distinct thing. The radical dualism that splits theory and practice into two different poles is challenged by critical social theory. Critical social theory encourages the development and use of theory as part of a broader quest for transformative knowledge, as opposed to what Althusser (1976) refers to as "theoreticism".

According to critical social theorists, a good education should educate students how to critically assess reality (ideology criticism) and how to envision a society that is more equitable and freer from oppression (utopian critique). To change the educational experience from that of knowledge transmission to one of knowledge transformation, social theorists promote the creation and use of theory that supports transformational learning approaches (Althusser, 1976). This concept could also promote a specific type of critical discourse (Leonardo, 2004). Critique "serves to improve learners' capacity to question, demolish, and then recreate information for the cause of liberation," according to exceptional education (Leonardo, 2004, p. 12).

But critical social theorists don't just concentrate on criticism. In their quest of a top-notch education, they also use a transcendental language that helps them visualize a better world and gives hope for both society and education (Giroux, 1983, 1988; Greene, 1986; Kincheloe, 1993). The Frankfurt School philosophers believed that a "false consciousness" constituted an emancipatory force, and their purpose was to liberate people from it. They were against positivism. They were skeptical of existing ideologies and the ideas that supported them because they believed that they hid socioeconomic injustices. As a result, change is necessary.

Because many student-teachers enter teacher-education programs with misconceptions about teaching, learners, , and the role of educational institutions in respective society, it is vital that this theoretical framework be applied (Carrington & Saggers, 2008). Traditional teacher education has transformed the power dynamic between institutions and the community, as well as institutions and academics. Agger (1991) argued that critical social theory can assist teachers in teacher education programs become more aware of their own biases by fostering self-reflection.

The role of educator education program is to offer students with the information, attitude, behavior, values, and skills they need to fulfil their future obligations. This study examines how a group of teacher-educators and student-teachers who studied a variety of sustainable development courses taught and learned. These courses aim to increase students their awareness of sustainability concerns and prepare them as a responsible citizen. Education for sustainable development is transformative in nature since it is based on the theoretical framework of critical theory. To determine the level of effort being put out to question the status quo, it is necessary to assess the state of teaching practices as they are now and student instructors' awareness of sustainability. This paradigm would affect how teachers interacted with their coworkers, students, methodology, and curriculum, inspiring them to continuously look for fresh methods to spot and eliminate injustices, advance inclusive education, and raise the caliber of instruction.

2.4.3 Constructivism

Constructivism provides a theoretical basis for the current research. Constructivist learning theories suggest that learning is a process in which individuals construct or develop through social interaction and experiences (Fosnot, 2013). Constructivist learning theorists believe that knowledge available out there and is not fixed. Constructivist theorists, in contrast to behaviorist theorists, emphasize on the development of conceptualization and validation of knowledge rather than memorizing the information presented in the book. Behaviorist theorist views learning as a relatively permanent change in the behavior of the individual while the constructivist theorist suggest that learning is a continuous process of knowledge construction. The constructivist learning theorist suggests that learning is an individually and socially active process and learners construct knowledge using the sensory inputs (experimental

learning). Moreover, the individual constructs their knowledge by contextualizing the available information. Furthermore, the learning is not instantaneous, and the learning develops their knowledge by revisiting the already developed conception and replace the previously build frame of reference with new information after validation.

Constructivism is strongly related to ESD and SD. Constructivist learning theories have implications for student cognitive and affective learning. Kalsoom (2019) argued that traditional teaching methods are not feasible to develop sustainability competencies. Further, Kalsoom (2019) argued that to develop sustainability competencies in learners, the learning should be provided with the opportunity to interact with appropriate pedagogical styles, content, and with each other. Along with cognitive learning, constructivist learning also emphasizes the affective domain of the learner. Kalsoom (2019) referred to affective learning as the transformation in the attitude of the learner which requires time.

Tam (2000) provided basic characteristics of the constructivist learning environment and stated that teacher and students both share the knowledge and authority, teacher act as a facilitator or guide, and teacher formulate small heterogeneous groups for student learning. Many researchers argued that traditional teaching styles no more suit the requirements of the modern era, and the teacher needs to change their pedagogical styles according to the needs of the students. Kalsoom (2019) stated that constructivism is the precursor of SD and provide a systematic route for SD. Therefore, to cater issues related to sustainability or SD, constructivist knowledge, practices, and thinking need to be encouraged.

2.5 Importance of ESD

Education for Sustainable Development (ESD) has a crucial role to play in promoting lifelong learning at all levels of education (Khanum, 2019, p. 55). The

United Nations recognizes the significance of ESD and considers it a key enabler for achieving the Sustainable Development Goals (SDGs) (UNESCO, 2005). The importance of sustainability education can be traced to the period of DESD. Given the importance to ESD, the goal of ESD is to integrate principles and values related to sustainable development into the teaching-learning process, with the expectation that this will alter students' attitudes and behaviors towards sustainability (UNESCO, 2007). At the 74th session of the UN General Assembly for Agenda 2030, the UN committee recognized the importance of ESD as a key enabler for achieving the Sustainable Development Goals (A/C.2/72/L.45). The implementation of Agenda 2030 for sustainable development has given a renewed impetus for ESD that the ESD can help as means to achieve all SDGs (Leicht et al., 2018, p. 25). ESD empowers and enables students to develop their competencies for a sustainable future by fostering reflection on their actions and informed decision-making, considering past, present, and future socio-economic and environmental impacts (Rieckmann, 2017).

Kalsoom (2017) notes that the nature of sustainability education is distinct from other forms of education, as it aims to transform students' consciousness towards the environment, society, and economy. McKeown et al. (2002) argue that improving literacy rates alone does not lead to sustainable development and that ESD highlights the problems of social injustice, environmental degradation, and inequitable economic development.

Equity, justice, tolerance, sufficiency, and accountability are the foundational ideals of ESD. As stated in the Earth Charter, it emphasizes caring, integrity, and honesty while advancing equality for women, social cohesion, and the decrease of poverty. ESD is based on values that promote democracy, sustainable living, and human welfare. Aside from tackling inefficient production and consumption practices, other

key ideas supporting ESD include ecological protection and restoration, resource preservation and sustainable usage, and the development of just and peaceful communities. – UNESCO (2009b)

ESD refers to a transformational approach to education that addresses pedagogy, sustainability content, learning environment, and learning outcomes. ESD not only addresses the sustainability concepts; climate change, diversity, pollution, sustainable consumption, and poverty into a different level of curriculum, it also emphasizes student-centered instructional strategies that emphasize learning rather than teaching. ESD asks for transformative and action-oriented teaching pedagogy, which supports participative, problem-oriented, collaborative, and self-directed learning. These pedagogies develop key competencies of learners for a sustainable future (Rieckmann, 2017, p. 7).

The public education system in any country is managed by a range of authorities, from government to university/college/school levels, and is constantly evolving to meet the changing demands of society. To effectively implement ESD, it is essential to first establish the underlying values and principles that are crucial for creating a sustainable society. Once this foundation has been established, education can be adjusted or refocused to align with these values (Khanum, 2019, p. 67). In light of these considerations, it can be stated that education has the capacity to play a critical role in realizing the sustainability strategy by connecting ecological, economic, and cultural variety.

According to Nevin (2008), ESD not only focuses on ecological issues but also addresses themes such as justice, human rights, women's rights, corporate citizenship, natural resource management, biological diversity, citizenship, unity, moral standards, and democratic accountability, both domestically and internationally. Some

characteristics are widely accepted as being necessary for the effective implementation of ESD, indicating the equivalent relevance of both the educational outcomes and the lifelong learning. Timm and Barth (2021) argued that the ESD is important for all education levels, particularly teacher-education, will play a crucial role for ESD integration into educational systems worldwide.

2.6   Bond   between   ESD,   Environmental   Education   and Development Education

Environmental, sustainability, and development education have more similarities than differences. These three focus on behavioral transformation and improving values, beliefs, and understanding. Three key areas value respect. It encompasses respect for self, others, the environment, and the world. A deeper look at each area reveals that each has a unique aim or mission (Nevin, 2008).

Environmental Education (EE) arose from a concern that social evolution was negatively affecting the ecological landscape, and its primary purpose is to protect and protect the planet, particularly natural ecosystems, and habitats. Development education's primary goals are to reduce hunger, encourage social justice and better the lives of individuals. It meets basic human needs even while connecting local and global activities. (Nevin, 2008). Development education (DE) emphasizes people's connection and interconnectedness on a global and local scale, but it does not typically include ecosystem interdependence or specific environmental issues. Human rights, inequality, poverty, and global citizenship are only some of the social concerns that dominate DE's focus. The goal of this field of study is to arm students with the tools they need to evaluate the current state of the world, predict its future, and take positive steps toward creating a more equitable and just society. It's quite comparable to other forms of political and civic education.

The major goal of ESD is to improve the life quality while minimizing environmental damage. As a result, while all three 'educations' have a lot in common, their fundamental objective is different (Nevin, 2008). ESD adds a significant environmental focus to the public health and human aspect in DE and other educational fields. Climate change, water pollution, oil shortages, the need to preserve biodiversity, poverty reduction, and human rights are just a few of the topics addressed by ESD, which is comparable to DE (Nevin, 2008). Moreover, ESD also contributes to the establishment of links among people's health in the developing and developed worlds, and it encourages us to connect our local actions to the needs and responsibilities of the people of the world.

2.7   Sustainability Education for Teachers' Development

Teacher education has been considered a key enabler for sustainability education at all levels of education (Kalsoom, 2017; McKeown & Nolet, 2013; Nolet, 2015).   The importance of teacher education for sustainability can be traced in UNESCO report (2005) that maintains that teacher-education institutions play vital roles in the education sector across the globe. These institutions have the ability to impact changes in educational standards, which in turn will have an effect on the abilities and knowledge of future generations. Learning is generally seen as the best chance for guaranteeing a sustainable future. So, the teacher role is integral (p. 12).

Teacher education is integral for the development of sustainable societies. Sustainability education facilitates teachers to acquire all those knowledge and skills needed for sustainability and further apply those skills in their future careers (Ferreira et al., 2007).   McKeown et al. (2002) argued that teacher education organizations require modification in teachers' training by including sustainability content in the educational process. In this regard, this action plan will help society to move rapidly

towards sustainability. According to Khanum (2019, p. 84) integration of sustainability education is useful in teacher education but unfortunately, implementation of ESD is not up to the mark in developing countries as they are struggling for basic services, furthermore, she also suggested that integration of ESD needs teachers training for sustainable societies. Hence, Teachers play a critical role in accomplishing ESD goals in the classroom. In the literature, it is commonly agreed that integrating ESD will be impossible without teachers' commitment to the paradigm shift.

Kabadayi (2016) argued that educators are not merely liable to teach students for professions, the teaching profession also requires their new roles regarding awareness of sustainability. Moreover, Albareda-Tiana et al. (2018) described that at the university level ESD should be considered for training the student' teachers for promoting citizenship awareness as they work as main agents for change in society. Sustainability education influences pre-service teachers' teaching practices in the future and makes them able to educate their future students on sustainability issues (del Carmen Pegalajar-Palomino et al., 2021).

Most essential, teachers' classroom methods should support educational values. Every culture has its own set of ideals. A value, according to Hartsell (2006), is a "personal opinion that an individual or society regards to be worthwhile," whereas morals is "the specific code of action employed to reflect that belief." Teachers can assist students in the promotion of values by teaching them how to comprehend themselves and others, as well as their connections to the natural and social world. This understanding provides a solid foundation for developing respect, as well as a feeling of justice, accountability, discovery, and debate. Furthermore, quality education and an effective learning setting are helpful in implementing ESD strategies in the classroom

(Chalker-Scott & Tinnemore, 2009). Therefore, only what students learn can be used to evaluate the effectiveness of ESD; not what they express personal support for.

According to Shephard (2008), teacher education programs must promote ESD to produce a sustainability-conscious workforce for the future. Sustainability implementation at entire levels of education demands trained teachers, who will apply their competencies in future practices, therefore special consideration must be paid to teachers' training in terms of SD (Bürgener & Barth, 2018). Anđić and Vorkapić (2017) Highlighted the role of teachers in developing global society, they argued that teachers' attitudes and behavior are often reflected through their learners' attitudes and behavior, and they become the true mirror of their teachers, therefore, teachers need to train in the field of SD. Similarly, As Loubser (2015) points out, SD relies heavily on both general sustainability education and specific teacher-education. In light of this, having school educators well-versed in SD is crucial for ensuring that sustainability teaching is effectively implemented. Furthermore, society's future development is reflected in teachers' knowledge, attitude, and behavior regarding SD.

2.8   Teacher-Education System of Pakistan

Teacher preparation plays a crucial role in the growth and development of the educational system. Both pre-service and in-service teachers are integral components of teacher education. The improvement of student learning and the overall growth of the school are two key benefits of teacher education that make it essential for the success of the education system (McKeown & Hopkins, 2014, p. 4). The National Educational Policy in Pakistan (GoP, 2017) places a strong emphasis on the development of teachers as they play a critical role in the implementation of educational reforms. Since 1947, there have been numerous recommendations made in different educational policies for teacher training in Pakistan. The country's teacher education

system can be divided into two main programs: in-service teacher training and pre-service teacher training (Durrani et al., 2019). The details of the teacher-education programs are given below.

2.9   Pre-Service Teacher Programs

In Pakistan, various educational programs have been offering pre-service teachers training. These programs are planned to train the teachers for the future generation. The details of the following programs as discussed below.

2.9.1   Primary Teacher Certificate (PTC) program

The Primary Teacher Certificate (PTC) program was a widely used teacher preparation program in Punjab before 2002. Its main goal was to train individuals who wanted to become primary level teachers, specifically at the primary education level. The program required individuals to have completed ten years of schooling before starting the one-year training period. During this time, participants received comprehensive instruction on various aspects of primary level education and teaching, including lesson planning, classroom management, and child development. The PTC program aimed to equip teachers with the skills and knowledge necessary to effectively educate and support students in their early years of schooling. However, the program was later replaced by the Bachelor of Education (B.Ed) degree program in 2002, which aimed to provide more comprehensive and up-to-date training for aspiring teachers in Punjab (Khanum, 2019, p. 26).

2.9.2   Certificate of Teaching (CT)

The Certificate of Teaching (CT) program is designed to provide training for individuals who wish to become elementary school teachers in Pakistan. This program requires participants to complete 12 years of schooling before embarking on the one-

year training program. The objective of the CT program is to equip teachers with the knowledge and skills necessary to effectively educate and support students at the elementary level. The program focuses on the development of pedagogical strategies, classroom management skills, and subject-specific knowledge to prepare teachers for success in their teaching careers.

2.9.3 Bachelors in education (B.ED.) programs

In 2002, the Pakistani government introduced a new teacher training program in response to the limitations of the previous certification courses, the Primary Teacher Certificate (PTC) and the Certificate of Teaching (CT). This new program was implemented in Punjab and aimed to provide more comprehensive and up-to-date training for aspiring teachers at both the elementary and secondary levels. Despite the introduction of this new program, other provinces in Pakistan continued to utilize the PTC and CT courses for teacher preparation. In 2009, the government updated its policy regarding the qualifications required for teachers at different education levels. According to this policy, it was recommended that individuals seeking to teach at the elementary level should possess a bachelor's degree along with Bachelor in Education (B.Ed) and those interested in teaching at the secondary level should hold a Master's degree along with B.Ed. This policy aimed to ensure that teachers were equipped with the necessary knowledge and skills to provide high-quality education to students and support their overall growth and development.

2.9.4 Masters in Education (M.A Education / M.Ed)

To prepare teachers for teaching at the higher secondary level, a Master's in Education is considered mandatory. The duration of the Master of Arts in Education (M.A Education) degree program is two years, which is taken after completing a

bachelor's degree. On the other hand, for the Master of Education (M.Ed) degree, a one-year training period is required after completing a Bachelor of Education (B.Ed) degree. Recently, the Higher Education Commission (HEC) replaced both of these degrees with the Bachelor of Science in Education (BS Education) and the Bachelor of Education (B.Ed Honors) degrees. The Master of Arts in Education degree is considered both a professional and an academic degree, which acknowledges its significance in preparing individuals for careers in the field of education. The degree program provides in-depth training on various aspects of teaching and education and prepares individuals to become knowledgeable and effective educators (Durrani et al., 2019).

2.9.5   M.Phil and Ph.D

In addition to the Bachelor's and Master's degree programs, teacher education in Pakistan also includes M.Phil (Education) and Ph.D. (Education) programs. These advanced degrees in education are designed specifically for teachers and are offered by higher education institutions. To pursue an M.Phil in Education, one must first have completed a Master's degree in education, with the duration of the M.Phil program typically lasting two to four years. Meanwhile, a Ph.D. in Education requires completion of an M.Phil degree in education and typically takes three to seven years to complete. These programs are not only considered as professional degrees, but they also offer teachers the opportunity to gain academic expertise in their field (Durrani et al., 2019).

2.10   In-Service Teaching Programs

In Pakistan, the responsibility for training in-service teachers falls on the Provincial Institution for Teacher Education (PITE). In the province of Punjab, the

Director of Staff Development (DSD) and at the national level, the National Institute of Science and Technology (NISTE) provide training to in-service teachers. The main institutions that offer teacher education programs are colleges of education and departments or divisions within universities.

2.11   Teaching Strategy

The terms "teaching styles," "teaching approach," "teaching method," and "teaching strategy" have often been used interchangeably in literature. However, some authors have noted that these terms have different scopes and meanings. According to Kushik et al. (2016), a teaching strategy is a specific method that a teacher employs, which involves the use of various materials, techniques, and procedures, to achieve specific instructional objectives. Similarly, Takac (2008) argued that teaching strategy includes all those activities that a teacher does for accomplishing educational goals. Matinding (2008) defines a teaching strategy as the choice of various teaching methods for classroom lessons. Echevarria et al. (2012) view a teaching strategy as a tool that a teacher uses to stimulate students' thinking and facilitate the completion of course content.

2.12   Teaching Approach

A teaching approach is a crucial aspect of a teacher's pedagogy and plays a significant role in the learning experience of students. It can be defined as the combination of a teacher's beliefs, teaching intentions, and teaching strategies that shape their actions and behaviors in the classroom. It is the way a teacher designs and implements instruction, utilizing various methods and techniques to achieve specific instructional goals. As described by Briede (2016), a teacher's approach is the relationship between their beliefs and actions in the classroom. Trigwell and Prosser

(1996) suggest that it is a mixture of a teacher's teaching intention and strategy, while Louws et al. (2017) define it as a teaching strategy that an instructor uses for effective teaching.

According to Wentzel (2002), the teaching approach adopted by a teacher has a significant impact on students' knowledge, attitudes, and behaviors towards their learning. A teaching approach is a blend of teaching methods that are used by teachers to achieve similar instructional goals (Hoyt & Lee, 2002; Pruekpramool, 2011). However, Alghazo (2015) argues that a teaching approach is not limited to a combination of teaching methods alone. It encompasses a broader range of factors, including instructional materials, course design, and the role of the teacher. The teaching approach also includes the development of lesson plans, the introduction of lessons, activities conducted in the classroom, and the assessment techniques used by teachers (Majozi, 2013). In conclusion, teaching approaches refer to teaching styles and several teaching methods that a teacher applied in the classroom.

2.13   Teaching Styles

The concept of teaching style has been widely studied and defined by various authors in the field of education. Darkenwald (1989) defines teaching style as the set of behaviors displayed by a teacher to promote students' learning. Conti (1985) views teaching style as a teacher's persistent and consistent behaviors in the classroom that remain unchanged in various contexts. Meade (2003) refers to teaching styles as teaching methods such as role-play, lecture, cooperative learning, inquiry learning, and questioning. Morrison et al. (2019) also referred to teaching styles as an instructional method that includes various teaching strategies to achieve educational objectives.

The literature highlights the importance of analyzing teaching styles as they play a crucial role in the learning process. Kuchinskas (1979) found that a teacher's teaching

style has a significant impact on the learning environment than any other aspect. Different methods used by teachers are associated with their teaching styles, and their style is a means of attitudinal and behavioral transmission in the learning process (Conti, 1985). Conti & Welborn (1986) noted that teaching styles consist of a set of teachers' behaviors that can shape the learning content imparted in the classroom.

The main features of teaching methods include classroom assessment, individual projects, learning objectives, and learning environment (Schoen, 2018). Fischer and Fischer (1979) argue that the way teachers interact with students is defined by their teaching styles, while Galbraith and Sanders (1987) define teaching styles as a set of classroom actions performed by the instructor. Dunn and Dunn (1977) see teaching style as involving teacher philosophy, instructional planning, classroom design, grouping techniques, and instructional strategies. Fan and Ye (2007) view teaching style as a preferred way of problem-solving and decision-making in the learning process.

Cooper (2001) defines teaching style as a combination of teaching techniques, approaches, and methods used by a teacher in a specific subject. Heimlich and Norland (2002) argue that understanding teaching style is important for both students' learning and for teachers, as it provides opportunities for improvement in the learning environment. Conti (1985) highlights the substantial effect of teaching styles on teachers' behavior and divides teaching styles into two categories, i.e., student-centered and teacher-centered.

The literature also highlights the unique characteristics of each teacher's teaching style, which distinguishes them from others (Ghanizadeh & Jahedizadeh, 2016). However, teaching styles are different from teaching methods. A teacher's teaching style is the result of their attitude, beliefs, motivation, personality, control, and

can be seen in their teaching and learning processes (Wright, 1987). The teaching style is the attitude and preferred way of the usage of different methods and techniques (Beyhan, 2018). Mishra (2007) noted that just as individuals have learning styles, teachers also have teaching styles. Mahmoodi et al. (2021) argue that if a teacher knows their teaching style, they can engage students more effectively and impact their knowledge, attitude, and behavior. Teaching styles involve the exhibition of personality traits by instructors while managing the classroom, presenting teaching-learning materials, organization of skills, and application of various teaching methods in the classroom (Grasha & Yangarber-Hicks, 2000). Silver et al. (2007) argued that teaching style consists of a complex set of individual preferences like classroom organization, handling individual differences, speaking manners, and teaching strategies. Two most discussed teaching styles in the literature are as follows.

2.13.1 **Teacher-Centered Teaching Styles.**

The teacher-centered teaching style is one of the most common and widespread methods of teaching in the educational system (Gardiner, 1998). The reason behind the usage of a teacher-centered teaching style is based on the fact that students need teachers' guidance due to their limited experiences and knowledge (Buskard, 2019). In a teacher-centered environment, the teacher plays a dominant role in determining educational goals, directing students' learning, and selecting methods for knowledge dissemination, which often leads to a structured and controlled environment. In this style, the teacher acts as the center of all classroom activities (Audu, 2018; Serin, 2018). The teacher's role is to impart knowledge using traditional teaching techniques such as lectures, tutorials, mentoring, guided discussions, and controlled discussions (Lancaster, 2017; Lele, 2020). The teacher-centered teaching style has been criticized for promoting dependent learning and being linked with behaviorist principles of

educational philosophy (Huba & Freed, 2000; Pitsoe, 2008). The educator acts as the center of all classroom activities and learners and follows expert, formal authority, and direct instruction in their teaching styles (Audu, 2018). For Conti and Welborn (1986) teacher-centered style endorses dependent learning and is mainly linked with behaviorist principles of educational philosophy. The teacher applied traditional teaching skills to transmit the knowledge. The teacher who applied the traditional teaching approach in the classroom evaluate the students' performance with reference to memorized content applied by a teacher (Lele, 2020). Moreover, Lele (2020) proposed various teaching methods that come under the category of teacher-centered approach that are lecture, tutorials, controlled discussions, mentoring, and guided discussions.

The focus of teacher-centered teaching style is the dissemination of knowledge using traditional teaching techniques e.g., lectures. While the student-centered teaching style involves the utilization of teaching techniques according to the needs of the learners (Conti, 1985). The instructions through the "lecture only" technique is not in line with the modern requirements and teachers must concentrate on diverse teaching techniques (Çolak, 2015). Teaching and learning experiences can be improved by focusing on teacher-student interaction, encouraging cooperative learning, using active learning methods, reflecting on student learning, communicating high expectations, and using a variety of teaching techniques (Chickering & Gamson, 1987). Brookfield (2005) similarly identifies six traits that adult learners expect in learning including identifying their learning goals, talking about their experiences, determining what they gain from the learning, having preconceived goals and timelines, and finally, requiring flexibility to meet their learning needs and interests.

2.13.2 **Learner-Centered Teaching Styles**

Learner-centered activities can be referred to as the learning process where the maximum focus is given to the students' interest, students' responsibility, and active learning (Cannon & Newble, 2000) Student-centered learning is characterized by the active participation of students and the reduced role of the educators in the learning process (Audu, 2018). Students are encouraged to ask questions while the teacher summarizes classroom discussion and help students in solving problems (Audu, 2018). The accountability of the classroom instructor is to maintain a conducive knowledge environment as well as arrange students centered activities. Learner-centered teaching styles require the active engagement of students in the learning process and constructive feedback on student learning is on the part of teachers. The teaching methods followed by student-centered teaching styles include cooperative learning, inquiry-based learning, and problem-solving activities (Weimer, 2002).

2.13.3 **Grasha's Teaching Styles Model**

In 1994 Anthony F. Grasha proposed a very comprehensive teaching style model. In his article Grasha stated that every teacher has preferences towards teaching and student learning. He compared these styles with colors on the artist's palette, where one of these colors is mostly highlighted in the picture made by the artist. Similarly, a teacher may utilize a range of instructional techniques and teaching styles, but one dominant teaching style sets them apart from others and becomes most prominent. This style differentiates a teacher from other teachers. Grasha proposed five teaching styles which are following.

a. *Expert*. Teachers that use these methods have extensive subject-matter experience and tailor their lessons to needs of students. Expert teacher attempts to maintain superior status in the classroom by displaying extensive knowledge

and giving students challenging tasks. The main purpose of knowledge transmission is to help the learner to become a more competent and knowledgeable person. The advantage of this teaching style is that a more expert person helps the learner in developing basic attitude, knowledge, and skills. While on the other hand, the disadvantage of this type of teaching style is it may intimidate inexperienced students. Students can develop anxious behavior in the classroom. Grasha (1996) maintains that teachers having expert teaching styles follow strict discipline and power for students' learning that ultimately increase the student anxiety. furthermore, if a student can self-regulate their emotions will be more likely to perform better in the classroom; whereas students struggled academically if they are not able to regulate their emotions. Expert teaching may lead to minimizing the learner's understanding of the subject because of superficial knowledge presented by the teacher (Grasha, 1994).

b.   *Formal Authority*. Because of the formal authority that the teacher has as a result of his position as an educator and his extensive subject-matter expertise, the formal authority teaching style is accorded a high level of respect in the classroom. The teacher role is to set expected standards for students' behavior in the classroom, provide both negative and positive feedback, and establish learning objectives. The teacher has full authority in the instructional process. The advantage of this type of teaching style is that the teacher and students become clearer about learning expectations and outcomes. The disadvantage of this style is rigid behavior which can lead a teacher towards a rigid and standardized way of managing learner behavior which can hamper the creativity of students (Grasha, 1994).

c.   *Personal Model*. Teachers having this style mainly focus on teaching through the personal model. The educator models appropriate ways of thinking and behaving for the class to mimic. The emphasis, direction, and guidance of a teacher are all on the students following the educators' lead. Students become active members in the education process. They learn through observation and activities. Moreover, Grasha and Yangarber-Hicks (2000) argued that traditional teaching practices can lead to dependent participants in the class. Students' performance at risk is possible when the instructor uses their preferences to teach the students in a classroom.

d.   *Facilitator*. The teacher with this teaching style mainly emphasizes student-teacher interaction. Undertaking assigned tasks is a fundamental part of student learning. Students are encouraged to take initiative and responsibility, while receiving the necessary guidance from the instructor to complete the assignment at hand. The teacher guide students by asking questions, encouraging students in criteria selection, and making them informed about choices. The main focus is given to students' personal needs and students are encouraged to use alternative options. This style is time-consuming when direct instruction is needed (Grasha, 1994). The teachers develop independent thoughts of students through applying inquiry-based and students- teachers' interactions. One of the disadvantages of facilitator teaching could be students' uncomfortable feelings towards the teaching style if the teacher does not provide support in learning tasks. Moreover, teachers need to focus that facilitator teaching requires time, so the teacher can apply the additional methods of teaching to overcome the limitations of the facilitator teaching style (Grasha, 1996).

e.   *Delegator*. In this type of teaching style, the teacher delegates the authority to students. Students are free to choose activities and work as an autonomous team. The teacher is available to provide help when students needed it. Learner considers themselves as independent learners. Some students feel anxious when they work independently because they need teacher support, which in turn affects the students' performance (Grasha, 1994). The features of teaching styles proposed by Grasha represent various approaches, namely (i) teacher centered teaching is represented by formal authority and expert teaching styles, (ii) student-centered teaching is represented through delegator and facilitator teaching styles, and (iii) collaborative teaching approach is represented by personal model teaching style (Lele, 2020).

2.14   Teaching Styles/Approaches for Sustainability Education

Sustainability education has been under the consideration after the UN Decade of ESD. ESD not only focuses on how we learn for a sustainable future but also on how to teach these concepts (Missimer & Connell, 2012). Sustainability education, as defined by the United Nations Educational, Scientific and Cultural Organization (UNESCO), is an educational process that helps individuals understand the complex interrelationships between the natural environment, economic systems, and social values and behaviors is an educational process that helps individuals understand the complex interrelationships between the natural environment, economic systems, and social values and behaviors (Moore, 2005; Warner & Elser, 2015). Sustainability education aims to equip individuals with the knowledge and skills needed to address the complex environmental, economic, and social issues facing the world today (Greig & Priddle, 2019). Effective teaching styles / approaches are essential for delivering this education and fostering students' engagement and learning (Gamage et al., 2022).

The specific characteristics of teaching approaches for sustainability education include a focus on promoting an understanding of the interconnections between social, economic, and environmental systems, and a recognition of the complex and interrelated nature of sustainability issues (Warner & Elser, 2015). These approaches also prioritize hands-on, experiential learning and place an emphasis on student-centered and active learning (Kalamas Hedden et al., 2017; Parr & Trexler, 2011). Additionally, they often involve the use of real-world examples and case studies and may integrate the use of technology and multimedia resources to enhance student engagement and understanding (Cotton et al., 2009; Cotton & Winter, 2010; González-Zamar et al., 2020).

Another key characteristic of teaching styles for sustainability education is the integration of multiple perspectives and disciplines, including science, technology, engineering, arts, mathematics, humanities and so on so forth (Leal Filho, 2015). This interdisciplinary approach allows students to gain a more comprehensive understanding of sustainability issues, and to develop the critical thinking and problem-solving skills necessary to address these issues effectively (Christenson, 2004). Furthermore, sustainability teaching approaches often encourage students to reflect on their own values, beliefs, and behaviors, and to consider their personal impact on the environment, economy, and society (Sandri & Holdsworth, 2022; Savage et al., 2015). They may also involve collaboration and community building, as students work together to identify and address sustainability challenges in their local communities (Cotton & Winter, 2010; Inwood, 2019). Overall, the specific characteristics of teaching approaches for sustainability education emphasize the importance of promoting student understanding, engagement, and action in addressing complex sustainability issues (Bascopé et al., 2019; Gal & Gan, 2020; Littledyke, 2008).

ESD aims at transforming and motivating students using problem-based pedagogy, active learning, place-based, and community service learning, where students have the opportunity to work cooperatively and take actions for SD (Cirillo & Hoyler, 2015). McKeown and Hopkins (2017, pp. 33-34) assert that along with the inclusion of SD concepts there is a dire need to update and renovate the teaching approaches; the teaching methods in which students can ask open questions can think critically, make their decisions, and can work in a group. Further, they argued that teachers should utilize a student-centered approach rather than a teacher-centered one. ESD pedagogies are centered on problem-based learning which encourages the solutions of local problems in local contexts. Students can discuss and apply the values in sustainability learning environment (UNESCO, 2012a).

2.15 Concept of Consciousness

Consciousness refers to an individual's subjective awareness of their surroundings, thoughts, feelings, and experiences (Gericke et al., 2019). It is a complex and multi-faceted phenomenon that has been the subject of philosophical inquiry for centuries and scientific investigation for decades (Rahimian, 2022). Theories of consciousness have been proposed by a range of researchers and can be broadly classified into three categories: non-physical, physical, and functional (Chalmers, 1993; Seager, 2002). Non-physical theories posit that consciousness is a non-physical entity that is separate from the physical body and brain. Physical theories, on the other hand, suggest that consciousness is a product of the brain and its interactions with the physical world. Finally, functional theories propose that consciousness is a result of complex information processing within the brain (Seager, 2002).

The concept of consciousness refers to an individual's state of being aware, as well as their ability to have self-awareness and perceive their internal thoughts and

experiences (Manwani, 2017). Kozyreva (2018) defined consciousness as a mental experience that has a specific content and involves both the representation of that content and a reflection of the cognitive process. It is a multifaceted psychological concept with different interpretations (Gericke et al., 2019). Velmans (2009) breaks down consciousness into three aspects: self-consciousness, which is the ability to differentiate oneself from the external world, the state of wakefulness, and knowledge. According to Gericke et al. (2019), consciousness encompasses all perceptions and experiences that shape our attitudes, beliefs, and behaviors.

A high level of consciousness can have a significant impact on an individual's knowledge, attitude, and behavior (Gericke et al., 2019). When individuals are conscious and aware of their surroundings, thoughts, feelings, and experiences, they are more likely to engage in deep and meaningful learning (Anderson, 2018; Jordi, 2011; Sheckley & Bell, 2006). This leads to a deeper understanding of the subject matter, better retention of information, and a greater ability to transfer their learning to new situations (Sheckley & Bell, 2006). In terms of attitude, conscious individuals are more likely to have a positive and proactive approach to learning (Anghelache, 2014). They are motivated to seek out new knowledge and experiences, and they have a growth mindset that allows them to view challenges as opportunities for growth. This positive attitude towards learning can lead to a lifelong love of learning and a desire to continue to grow and develop as individuals (Gericke et al., 2019). In terms of behavior, conscious individuals are more likely to adopt positive and sustainable behaviors in all areas of their lives (Pockett, 2004). By being conscious and aware of their thoughts, feelings, and experiences, individuals are better equipped to make informed and deliberate decisions that positively impact their lives and the lives of those around them (van Gaal et al., 2012). In conclusion, consciousness plays a crucial role in shaping an

individual's knowledge, attitude, and behavior. By fostering a high level of consciousness, individuals are able to engage in deep and meaningful learning, adopt positive attitudes and behaviors.

2.16 Environmental consciousness to sustainability consciousness

Environmental consciousness, as a term, refers to a growing awareness and concern for the environment, and the impact of human activities on the natural world (Zheng, 2010). This consciousness can manifest in a variety of ways, including a concern for preserving natural resources, reducing pollution, and conserving biodiversity (Khrushch & Karpiuk, 2021). Environmental consciousness has been widely researched and studied and has been shown to be positively associated with pro-environmental attitudes and behaviors (Mathur & Kumari, 2013; Zheng, 2010). However, environmental consciousness has been criticized for its limited scope, as it tends to focus on individual behaviors and actions, and often neglects the wider, systemic issues that contribute to environmental problems (McKenzie-Mohr & Smith, 1999).

The concept of sustainability consciousness (SC) has been a challenging and complex topic to define in literature. As noted by Gericke et al. (2019), there is no comprehensive definition that can fully capture all aspects of sustainability. Environmental consciousness, which is often considered a precursor to SC, has been defined differently across various disciplines (Awan & Abbasi, 2013; Kalsoom & Khanam, 2017). This results in different understandings and interpretations of the concept within the same discipline. It encompasses psychological factors that are related to an individual's intention to act in an environmentally responsible manner (Schultz et al., 2000). On the other hand, Sánchez and Lafuente (2010) define

environmental consciousness as a multidimensional concept that encompasses affective (attitude), cognitive (knowledge), and behavioral (action) dimensions.

Ahmad et al. (2020) defined environmental consciousness as an individual's understanding and behavior towards managing the relationship between humans and their environment. Schlegelmilch et al. (1996) similarly characterized it as an evaluation of, or outlook on, facts and actions that have an impact on the environment, either one's own or others'. Kaffashi and Shamsudin (2019) viewed environmental consciousness as individuals' attitudes and perceptions towards environmental issues and their concerns for resolving them. Environmental consciousness is a set of beliefs that shape individuals' attitudes and behaviors towards environmental matters (Zelezny & Schultz, 2000). These beliefs are influenced by psychological factors that play a role in human behaviors related to the environment (Zelezny & Schultz, 2000).

Sustainability consciousness, on the other hand, encompasses a more comprehensive and holistic understanding of the interconnectedness of social, economic, and environmental systems, and recognizes the need to balance these systems in order to achieve long-term sustainability (Dalal-Clayton et al., 2002). Sustainability consciousness goes beyond simply being aware of environmental issues, and instead seeks to address the root causes of environmental and social problems (Aleixo et al., 2021; Boeve-de Pauw et al., 2015)

Studies have shown that the shift from environmental to sustainability consciousness is driven by increased awareness of the need for a more integrated approach to environmental and social issues (Olsson & Gericke, 2016). For example, research has shown that individuals with higher levels of sustainability consciousness are more likely to adopt sustainable behaviors and support pro-sustainability policies (Steg & Vlek, 2009). Despite the shift towards sustainability consciousness, there are

still significant barriers to the widespread adoption of sustainable practices (Akenroye et al., 2021; Rodriguez et al., 2009). For instance, some individuals may view sustainability as conflicting with economic growth or may not fully understand the connections between their behavior and larger sustainability challenges (Kalsoom & Khanam, 2017). Addressing these barriers will be critical in promoting a more sustainable future. The shift from environmental consciousness to sustainability consciousness reflects a recognition of the need to address the root causes of environmental and social problems, and to consider the interconnectedness of social, economic, and environmental systems. significant progress has been made, there is still much work to be done to fully integrate sustainability into our decision-making processes and create a more sustainable future (Scott et al., 2022).

2.17   Sustainability Consciousness

Sustainability Consciousness (SC) is a holistic approach that encompasses an individual's behavior, attitude, and knowledge towards the three pillars of Sustainable Development (SD): economy, environment, and society (Ciegis et al., 2009; Harris, 2000). The origin of SC can be traced to the larger concept of SD and the term pro-environmental consciousness (Olsson et al., 2016). According to Kalsoom (2017), SC is a more complex concept than pro-environmental consciousness as it involves the inter-relation between attitude, knowledge, and behavior towards the three components of SD. Berglund et al. (2014) introduced and operationalized the term SC in a Swedish context. Further, they developed a standardized instrument for measuring SC, rooted in a questionnaire developed by Michalos and his colleagues in 2012 (Kalsoom, 2017, p. 35).

Berglund et al. (2014) claimed that SC is a holistic approach that includes individual behavior and attitude towards SD. They developed the SC concept by

integrating knowingness, attitude and behaviors related to the three pillars of SD: environment, economy, and society. Olsson et al. (2016) also discussed the details of the term knowingness, attitude, and behavior towards SD. They define sustainability knowingness as "knowingness about SD fundamentals in which SD rooted''. Furthermore, sustainability knowingness includes both cognitive and affective components.

According to Olsson et al. (2016), a sustainability attitude means a person has a positive and negative emotional state towards sustainability issues, while sustainability behavior is individual actions towards SD. To define the knowingness, attitude, and behavioral aspects of SC Berglund et al. (2014) asserted that knowingness means knowing about the basics of SD. These fundamentals or basics can be attained from fifteen sub-themes of the three pillars (economy, environment, society) of SD. Furthermore, they argued that the reason behind the use of the word "knowingness' instead of knowledge is that SD requires the most comprehensive words to define it. Knowledge is based on very specific and exact reality and can be defined at different levels. Therefore, it would be challenging to include and exclude the terms in the knowledge domain in the SD perspective. Kollmuss and Agyeman (2002) categorized behaviors and emotions into an affective domain that includes individuals' emotions. Behaviors can be described as what an individual does while attitude is feeling and emotions towards SD.

Figure 2.1

Dimensions of SC (Olsson et al., 2016)
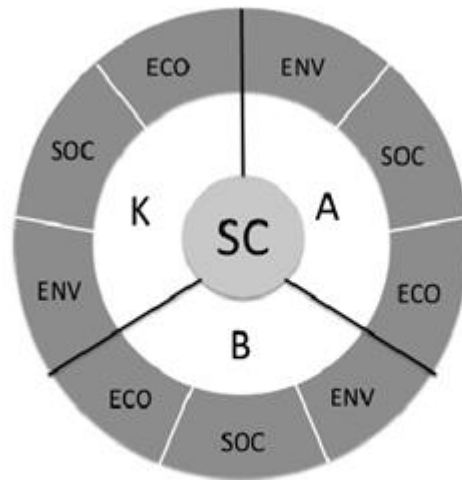
A representation of the concept of sustainability consciousness. K=know-
ingness; A=attitude; B=behavior; ECO=economic; SOC=social;
ENV=environmental; SC=sustainability consciousness

2.18   Economic Consciousness

Economic dimension or Economic stability means organizational
attitude for making a profit and along with gaining profit it also protects the
social and environmental dimension of sustainability (Margherita & Braccini,
2020). Jovic and Novčić (2016) stated that the economic dimension of
sustainability involves the efficient procedure of scarce natural assets and the
advancement of technology that will contribute towards energy saving.
Furthermore, the core of the economic dimension is to make certain the effective
growth for SD. Sheth et al. (2011) proposed two aspects of economic
sustainability; one aspect is related to conventional monetary performance such
as cost reduction, and the other is related to external investors' interest. They
also maintain that both factors can contribute towards making the relationship
between firm performance and community development.

According to Stanković et al. (2021) Economic dimension includes various indicators that represent the economic performance of the state, employment data, transport activity data, and economic data. For, Rizzo et al. (2021) economic stability refers to employment, production, consumption, balanced income supply, and poverty alleviation. Similarly, Sucozhañay et al. (2021) define the economic dimension as attaining business productivity by providing goods or services without compromising on environmental and social values. According to Flour et al. (2021), economic sustainability involves addressing current and future customer needs. According to Phillis et al. (2021), the economic component incorporates several indicators concerning energy production, supply, security, and other related topics.

2.19 Social dimension

The social dimension refers to the social pillar or social sustainability (Janker & Mann, 2020). The social dimension of SD involves the influence of organizations on societal issues and society such as Charities, community relations, and social support. A developed society holds community members with joint common sense, shared interests, and mutual social relations (Kim, 2018). Choi and Ng (2011) maintain that the social dimension primarily focuses on the welfare of communities and people as a non-economic form of capital. Sustainability problems can be resolved through maintaining a balance between personal needs and societal needs as well as nature's capacity to care for human life. Eisenberg and Mussen (1989) Stated that the social dimension reflects the individual behaviors that provide benefits to a group of individuals. Hence, individual motivation to consume responsibly is mainly grounded in the consciousness of doing well to others. Social responsibility is the usage of

products with having hope to reduce harmful effects and take full advantage of useful impact on society (Mohr et al., 2001).

Janker and Mann (2020) stated that ESD should focus on the social dimension as it is one of the analytical dimensions of sustainability, and central to accomplishing the individuals' needs according to the definition of SD. Moreover, Janker and Mann (2020) extracted the various themes of social sustainability through thematic analysis that are human rights, work-life quality, and context embeddedness of societal aspects. Phillis et al. (2021) argued that the social dimension contains indicators that describe health, resource accessibility and affordability for Masses.

2.20 Environmental dimension

According to Margherita and Braccini (2020), environmental sustainability includes organizational practices that consider environmental problems, for example resource restoration, climate change, and ozone depletion. By giving importance to climate change for SD, Singh (2022) stated that environmental sustainability refers to the effective management of natural resources with a plan to make them available for the future generation. Likewise, Rizzo et al. (2021) listed that the environmental dimension includes the impact of human actions on natural resources generally in terms of resources misuse and waste generation. Environmental sustainability includes water pollution, air pollution, deforestation, climate change, and land degradation (Phillis et al., 2021). Lin et al. (2022) argued that environmental sustainability means reducing the environmental impacts and preserving ecological balance for the future as well as formulating a plan for decreasing resource consumption (Lin et al., 2022; Yuan et al., 2014) . According to Pandey and Pandey (2020), the environmental dimension of SD ensures the quality of all the aspects of environmental development that ultimately ensure the economic development and work-life quality of people. Penzenstadler et al.

(2013) explain that environmental sustainability covers the protection of natural resources, for example, land water, air, ecosystem, and minerals for the development of human welfare. Furthermore, Mohammed et al. (2021) environmental sustainability refers to effective consumption of natural resources having minimal effects on the environment. on the contrary Islam et al. (2014) stated that environmental sustainability is doing developmental practices without upsetting the globe's ecological stability.

2.21   Research Studies on Sustainability Consciousness

The Decade of Education for Sustainable Development [DESD](2000-2010) prioritized research on sustainability education, with a focus on increasing students' SC. Various research have been conducted in several contexts by researchers all over the world. Thaiprayoon et al. (2019) studied the employees' SC of the manufacturing sector. The researcher argued that an organization couldn't achieve sustainability without the employee's SC. The findings of the research indicated that employees' performance in an organization is highly correlated with their SC. The results of this study suggest that organizations in Thailand need to focus on developing and promoting sustainability consciousness among their employees and suppliers in order to achieve better sustainability performance. Rojter (2012) maintains that students' SC can be developed through curriculum implementation; sustainability-related concepts in the curriculum would help the learners to analyze the problems that affect SD in the engineering field. The study found that incorporating sustainability education into engineering curriculum, particularly through materials education, can have a positive impact on students' sustainability consciousness. Specifically, the study found that materials education can help students understand the environmental impact of materials choice and usage, and the importance of designing sustainable products and systems. Korsager and Scheie (2019) identified the effectiveness of SD projects on learners' SC.

The study explored the impact of education for sustainable development (ESD) on the development of sustainability consciousness among students. The study was a case study of students who participated in an ESD project. The study found that participating in an ESD project can have a positive impact on students' sustainability consciousness. Specifically, the study found that students who participated in the ESD project showed increased awareness and understanding of environmental issues and their impact on the planet, as well as increased engagement in pro-environmental behaviors.

Similarly, Berglund et al. (2014) conducted a study aimed to examine the effects of education for sustainable development (ESD) on the sustainability consciousness (SC) of upper secondary students in Sweden. The study compared two groups of students: one from schools with a profile of ESD and the other from comparable schools without explicit ESD-profile. The study found that there were significant differences in SC between students from schools that teach with an ESD approach compared to students from regular schools. The study concluded that the implementation of ESD has a positive impact on students' SC and suggested that further research is needed to better understand the nature and effects of the implementation of ESD in order to enhance its impact on students' SC.

Similarly, Olsson et al. (2016) conducted research to assess the effectiveness of education for sustainable development (ESD) in developing students' action competence for sustainability. The study used a three-wave longitudinal design, which involved 760 Swedish upper secondary students. The students were surveyed to assess their self-perceived action competence for sustainability and their experience with ESD teaching in their school. The results of the study showed that ESD has an effect on students' action competence for sustainability. The study also found that it is possible to develop students' action competence through ESD teaching. The study also revealed

that students did not significantly develop the confidence component of action competence under their own influence. Findings from this study corroborate those of Berglund et al. (2014), who found that students in schools with an ESD profile tended to be more sustainability aware.

Al-Nuaimi and Al-Ghamdi (2022) conducted a study to assesses the sustainability consciousness of higher education students in Qatar and evaluates the impact of Education for Sustainable Development (ESD) on their knowledge, attitudes, and behaviors towards sustainability. The results indicate that over 80% of the students have a basic understanding of sustainability-related knowledge, but their attitudes and behaviors towards sustainability gradually decrease. The findings of this study suggest that there is a need to improve the current state of sustainability education in higher education institutions to better prepare students to meet the challenges of sustainability and contribute to the achievement of the United Nations Sustainable Development Goals (SDGs).

Nolan (2020) conducted a qualitative research with elementary school student in Ireland. The education's overarching objective is to evaluate the impact of biodiversity tutoring on students' SC in elementary school. Findings from this study indicate that student awareness of sustainability issues in both the environmental and social spheres is significantly boosted via exposure to biodiversity education. Whereas students' sustainability-conscious in economic dimension was not fully developed. Based on the research findings Nolan suggested that biodiversity education should be implemented for developing primary school students' SC.

The studies on the impact of Education for Sustainable Development (ESD) on students' sustainability consciousness (SC) provide valuable insights into the effectiveness of ESD in promoting sustainability awareness, knowledge, attitudes, and

behaviors. Overall, the results of these studies suggest that ESD has a positive impact on students' SC, with most studies finding significant differences in SC between students with ESD approach and those from regular schools. However, the findings from these studies should be interpreted with caution as there are some limitations that need to be considered. Firstly, the studies are primarily conducted in specific regions (Thailand, Sweden, Qatar, Ireland) and cultural contexts, and the generalizability of the findings to other countries and cultural contexts is not established. Secondly, the studies use different methodologies, approaches, and measures, making it difficult to compare results across studies. The results of the studies suggest that there is a need to improve the current state of sustainability education in higher education institutions, as well as to better understand the nature and effects of the implementation of ESD in order to enhance its impact on students' SC. In conclusion, the studies provide evidence for the positive impact of ESD on students' SC, but more research is needed to establish the generalizability of these findings to other cultural and educational contexts, as well as to further understand the nature and effects of the implementation of ESD.

2.22   Teaching styles and Student Learning

Many researchers proposed various models for effective teaching to enhance student learning and achievement. A sizeable number of researchers endorsed the idea of adopting an appropriate teaching style to facilitate student learning and achievement (Silvernail, 1989; Wetzel et al., 1982). Some researchers are of the view that the educational processes not only affect student achievement in the short term but may also influence individual future life and outcomes (Hidalgo-Cabrillana & Lopez-Mayan, 2018).

Many researchers are of the view that a student-centered teaching style pals a significant role in individual learning (Freeman et al., 2011; Nghia et al., 2020; Rees &

Roth, 2019). A student-centered teaching style is characterized by active involvement of students/learners in the learning processes (McConnell et al., 2021). The Student-centered teaching style emphasizes the adoption of various teaching strategies and techniques e.g., classroom discussions, problem-solving, research projects so on so forth (Czajka & McConnell, 2019). Various researchers endorsed the student-centered approach of teaching to transform student learning in modern era education (Hora et al., 2020). McConnell et al. (2021) argued instructors must select /her teaching styles as per the requirements of the classroom and students' interests.

Teachers' role and importance has been identified by many researchers and emphasized that, in the modern era, teachers are expected to do more than they had done before to provide each student with quality education (Fitzgerald, 2015). Fitzgerald (2015) argued that teachers are not only responsible to help struggling students, but they should also indulge themselves in practices that may help students to overcome the obstacles they face daily. According to Razak et al. (2015), the classroom atmosphere, student learning, and motivation have a favourable influence on students' thought processes and largely depend upon the mode trainers teach in the classroom. Tang et al. (2020) studied the connection between intellectuals learning participation and their instructor teaching styles in Taiwan. They conducted a case study method, the findings of the research revealed that expert model teaching style and delegator instructor teaching styles predict the significant relationship between the students learning and educators' instructional techniques.

Stanford (2014) conducted a causal-comparative research study on math teachers' pedagogical styles and their student's achievement scores in the subject of mathematics. The population of the research study was elementary level students, the research findings explored that student performed better results of teachers applied

facilitator style and delegator style of teaching in the classroom. Moreover, the researcher argued that along with educators teaching styles the teaching experience of the teacher also matters in the performance of students.

The role of teaching styles in students' learning has been studied in the perspective of various subjects e.g., history (Ibrahim & Ahmad, 2016), Mathematics (Akiba & Liang, 2016), ICT (Comi et al., 2017), Science (Mikeska et al., 2017), Statistics and Material Mechanics (Arfandi et al., 2018), Biology (Audu, 2018), Pharmacy Courses (Shi et al., 2007) foreign languages (Marina et al., 2019), and so on so forth. Although many researchers provided "good teaching practices" to promote sustainability in the classroom, however, most of the studies are rather inconclusive or merely focus on one dimension of teaching (Jones, Selby, & Sterling, 2010; Kalsoom, Khanam, & Quraishi, 2017). There is a dire need to investigate various teaching styles on students' learning outcomes (knowledge, attitude, and behavior) in sustainability-related subjects.

Sustainability is an interdisciplinary concept and required inter-disciplinary thinking for effective learning and implementation. Spelt et al. (2009) referred to interdisciplinary thinking as the capacity of individuals to integrate the knowledge of more than one discipline. As sustainability is an inter-disciplinary concept therefore students require a considerable amount of time and help in building capacity to synthesize and create a meaningful connection between various disciplines (Spelt et al., 2009). The student may find difficulty in synthesizing new information and the connection between various disciplines and appropriate teaching styles may help in coping with these difficulties (Bradbeer, 1999).

Central to learner-centered teaching; the role of the teacher is more inclined towards students' interests, needs, and abilities. Teachers arrange classroom activities

according to the student learning styles (Wright, 2011). Doyle (2008) explains the transformation of learners' roles and responsibilities in students centered environment that goes far beyond only notes taking. The teacher provides a learning environment where students have full control over their own choices. Besides this, the educator helps and encourages the learner in the learning process. Woolfolk-Hoy (2005) argued that a student-centered learning environment also affects course content, activities, and students' pace of learning. Learners become free to complete their activities according to their own pace. Furthermore, educators also share class control towards students (Brown, 2008).

2.23   Teaching styles and sustainability consciousness

Following a thorough examination of the literature, it was discovered that relatively few research on the effectiveness of educating about SC had been done. Several studies have been conducted on teaching/pedagogy, environmental consciousness, critical consciousness, attitude towards SD, but not specifically on teaching and SC as SC is an updated concept proposed by (Olsson et al., 2016)

Authors	Research Design	Population	Teaching style	Country	Learning outcome
Kalsoom and Khanam (2017)	Action research	27 student-teachers	Inquiry based	Pakistan	Sustainability Consciousness
Colás-Bravo et al., (2018)	qualitative	25 Students' teachers	e-portfolio	Italy	Sustainability Consciousness
Nazir and Pedretti (2016)	Phenomenological case study	9 In-service educator	Outdoor experiences	Canada	Environmental Consciousness
Gedžūne and Gedžūne (2011)	Action Research	39 students' teachers	Reflection Field experiences	Latvia	Ecological consciousness
Peterson (2019)	Participatory research		Use of pictures		Ecological consciousness
Estrada Alvarez, (2007)	Naturalistic inquiry	6 students' interviews	Projects	Columbia	Environmental consciousness

Licata, (2011)	Action Research	15 students	Critical pedagogy site visits and fieldwork, lecturing, debates, concept mapping, group work, worksheets, implementation of civic actions, and development of digital stories	New York	Environmental consciousness
Malandrakis, (2022)	Experimental research	77 student's teachers		Greek	Sustainability consciousness

Integration of sustainability education is not confined to the inclusion of SD concepts in the teacher education curriculum. Sustainability education needs transformative pedagogies to implement the course content in the most effective way (Sterling & Thomas, 2006). There have been several studies carried out to check the relationship or effectiveness of teaching on students' consciousness for SD. If we analyze the studies in literature, we can find various techniques and variables that have been implemented to study the discussed variables. Such as, Kalsoom (2017) conducted an action-research study on students' teachers in Pakistan. The main purpose of their research was to enhance the SC of students by applying an inquiry-based teaching style. Using Inquiry-based teaching researchers engaged learners in discussions based on sustainability problems and research-based techniques. Their study's results have shown that students' SC could be enhanced by engaging students in the inquiry process. Similarly, Colás-Bravo et al. (2018) conceded out a qualitative study on students in the milieu of Italy. In their study, E-portfolio was used to enhance the SC of students' teachers. Researchers argued that students' SC is a key competency of SD. Furthermore, they suggested that teachers need to develop the critical thinking and reflection skills of students needed to promote SD.

Malandrakis (2022) developed the SC of pre-service teachers by applying constructive teaching approaches in the Greek educational setting. For developing the SC of student-teachers and more specifically social dimension of sustainability, Malandrakis (2022) conducted pre-posttest experimental research, in which the researcher applied various sustainability pedagogies; discussion method, lecturing, site visit, group work, and concept making teaching methods to enhance the SC. The findings indicated that sites visit, and concept mapping positively increased the students learning for SD. Nazir and Pedretti (2016) conducted a case study in Canada on in-service educators. They assess the perception of Canadian educators about how outdoor activities help learners to develop environmental consciousness. The study findings highlighted the importance of outdoor engaging experiences in raising pupil SC. They contribute that the relationship between humans and the external environment is important for developing an individual's environmental consciousness.

Gedžūne and Gedžūne (2011) developed student-teachers ecological consciousness through action research. All the participants were selected from Daugavpils University situated in Latvia. Researchers engaged learners in reflections and fieldwork activities to improve the students' teachers' ecological consciousness. Furthermore, Peterson (2019) utilized art-based teaching in the classroom to develop students' ecological consciousness. The study findings show that teachers can enhance the ecological consciousness of learners using an experiential learning approach in the classroom. Estrada Alvarez (2007) investigated the perception of students about the effectiveness of content lived experiences on the development of environmental consciousness. The study results depicted those children nine to ten years old gained positive experiences for the development of environmental awareness. Critical pedagogy is considered an effective pedagogical technique for developing individual

consciousness. Licata (2011) conducted action research to investigate the role of critical pedagogy in the enhancement of environmental consciousness. The outcomes of the research show that sustainability education is an integral part of SD. Chen (2019) investigated the role of teaching strategies on the improvement of students' environmental consciousness based on students' personality traits. The study results indicated that teachers teaching styles can enhance the environmental consciousness of students in Chinese settings.

2.24   Attitude Towards Sustainable Development

Attitude is a subjective and theoretical concept that refers to one preference for an object or item or disclination to an idea (Vithessonthi, 2009). Thomas (2005) maintains that Attitude has two aspects one can be defined as belief and the second is affective, belief aspect explains the cognitive processes to define an object, while the affective aspect deals with preferences towards an object (Katz, 1960). For, Perloff (1993) attitude is the expression of one's beliefs that he exhibits through actions and thoughts. In 2015, 193 countries from all over the world participated in the UN General assembly meeting. In this meeting, SDGs were drafted to be attained by the year 2030. SDG's cover all the three dimensions (economy, society, environment) needed to gain SD (Saner et al., 2019). Kanapathy et al. (2019) argued that attaining SD goals needs to change the attitude and perception of individuals, and this can be possible through education. Thomas (2005) highlighted the importance of learners' attitude towards SD, and attitude can be developed through pedagogical approaches for sustainability curricula.

Al-Naqbi and Alshannag (2018) emphasized the role of higher education institutions, which are fundamental places to develop the future professional attitude and perception towards SD, that ultimately helps in achieving SDGs. Ambusaidi and

Al Washahi (2016) maintain that the achievement of SD can be possible through the active role of education, education plays main role in developing the attitude and behavior of individuals. Tomas et al. (2017) did a study on the effectiveness of SD-relevant courses on developing students' attitudes towards SD. The study findings showed that EfS courses should be offered in institutions for changing students' attitudes and behavior. Moreover, they analyzed that these courses also develop teachers' self-efficacy to teach SD.

McKeown (2002) stated that SD aims to improve the quality of life on earth and the improvement of life requires an attitudinal and behavioral change of individuals towards environmental problems and issues. Moreover, social sciences and humanities fields need to focus on the SD knowledge that can help to understand and implement SD-related principles. Shephard (2008) argued that Students develop their attitude towards SD through the affective domain of learning. Therefore, educational institutions need to focus on the affective domain. Tang (2018) conducted a research study on engineering students in Malaysia. The research study was correlational through which the researcher tried to find out the relationship between sustainability education and engineering pupils' attitude towards SD. The findings of the research explore that the Sustainability course positively impacts the learners' beliefs and attitudes towards SD. Further, the researcher argued that SD courses should be applied in classrooms for imparting the SD values. Tomas et al. (2017) investigated the effectiveness of Efs on students' teacher perception, experiences, and attitude towards sustainability. Participants of the research study responded that the Efs unit significantly affects their learning and more specifically practice pretended activities to develop their efficacy to teach SD in the future.

2.25 Behavior Towards Sustainable Development

'The term "behavior" describes how one behaves or acts, as well as any material's response to a situation. (Cao & Philip, 2012). According to Reid (2013) behavioral component deals with an individual inclination towards actions about something or someone. Michalos et al. (2012) accompanied a study to quantify the students' behavior for SD, the study's results show that students' behaviors are mainly influenced by their knowledge and attitudes towards SD. Furthermore, Barron et al. (2005) argued that individual' behavior is a central point to put the overall society's impact on SD. Nousheen et al. (2020) conducted a research study on students' teachers' attitudes towards SD, the research finding indicated that students having more awareness leads towards change in individual' behavior, therefore educational institutions need to integrate sustainability education at different levels of education.

Leiserowitz et al. (2005) Maintain that the development of individual behavior for environmental and societal issues is needed to give the knowledge of SD and changing the attitude of individuals for SD. Religious and societal values can also contribute to changing individual behavior. Ceylan (2019) studied the relationship between consumers' sustainability knowledge, attitude, and behavior. The study results suggest that detailed knowledge of different factors that affect SD should be given to the people for changing the behaviors towards SD (Islam et al., 2019).

Badea et al. (2020) explain that awareness of sustainability challenges is central to changing the learner behaviors. Furthermore, they also argued that the role of teaching staff, teaching techniques, and integration of sustainability concepts in the curriculum are fundamental for developing the awareness of students for SD.

2.26   Teaching Styles and Attitude Formation

According to the literature, there is a link between teacher-educator teaching techniques and student-teachers attitudes towards their learning. The role of Teaching

styles for the Development of students' attitudes could not be unnoticed by the instructor, because teaching strategies mainly depend upon learners' acceptance of teachers' behavior (Cai, 1995, p. 25). Duman and Yavuz (2018) researched the effectiveness of PBL problem-based learning on learners' attitudes towards English learning, the study results showed that PBL has a relationship between teacher teaching approach and students' attitude towards English learning. Similarly, Akınoğlu and Tandoğan (2007) and Nwagbo (2006) investigated the role of teaching methods in developing students' attitudes towards the subject of biology and scientific literacy, the results of research study found that the guided inquiry method helps the learner in developing their attitude towards science learning whereas expository method leads to change cognitive aspects of learners. Sugano and Mamolo (2021) explore the role of teaching methodologies in increasing the attitude of learners for chemistry' education, their results findings show that students showed a greater aptitude for chemistry learning who have been taught through cooperative learning techniques as compared to those who learned the chemistry concepts by traditional approaches. Akınoğlu and Tandoğan (2007) conducted experimental research on attitude of pupils towards science learning, the research findings highlighted the role of the PBL approach to teaching in developing learners' attitudes. Michel et al. (2009) studied the effectiveness of teaching styles (active teaching and passive teaching) on students learning. They maintain that teachers in the classroom apply either active teaching style or passive teaching style. Furthermore, an active teaching style can alter the learner's attitude towards learning and active participation in the classroom. Whereas the traditional teaching style restricts the active participation of students that ultimately effect students' attitude. Students' attitudes and behaviors are influenced by the teaching method. Instructors who have to

control the classroom and create a favorable learning environment quickly lose effectiveness (Eschenmann, 1991).

The classroom environment can play integral role in students' learning patterns and behaviors. It has an influence on students' capacity to self-regulate, their sense of independence, and identity development; as a result, children grow skeptical about their ability to achieve and question the value of education, which may lead to lower academic effort. In this learning period, the classroom environment, which includes teaching styles, becomes extremely important (Michel et al., 2009).

Summary of the Literature Review

The review focuses on the movement towards sustainable development and its evolution as a concept and practice. The importance of sustainability in today's world is emphasized, and the role of education in promoting sustainable development is discussed. The definition, goals, and dimensions (economic, social, and environmental) of sustainable development are covered. Education for sustainable development (ESD) is presented as a tool for promoting sustainable development, with a focus on the goals and objectives of ESD such as the development of knowledge, skills, attitudes, and behavior needed for sustainable living. The theoretical foundations of ESD are discussed. The importance of integrating ESD into all levels of education, from primary to tertiary, is highlighted. The relationship between ESD, environmental education, and development education is explored, emphasizing the need for a multi-disciplinary approach to sustainable development. The significance of sustainability education for teacher development, including the need for teachers to have a deep understanding of sustainable development is discussed.

The review covers various teaching strategies and approaches that can be used in ESD, including inquiry-based learning, problem-based learning, project-based

learning, experiential learning, hands-on learning, interdisciplinary approaches, traditional lecture-based teaching, interactive teaching, and hands-on learning. The most effective teaching styles and approaches for promoting ESD are outlined and how they can be used to engage students and support their learning. The concept of consciousness and its relationship to sustainable development is discussed, along with models and frameworks that support ESD and sustainability education. The findings of research studies on sustainability consciousness, including studies on attitudes towards sustainability, behavior towards sustainability, and the impact of education on sustainability consciousness, are summarized. The relationship between teaching styles and the development of sustainability consciousness is explored, with studies showing that teaching styles can impact student learning (sustainability consciousness). The relationship between education and knowledge, attitude, and behavior towards sustainable development is also explored, with research indicating that ESD can impact individuals' attitudes, behaviors, and understanding of sustainability. Overall, the literature review highlights the importance of education for sustainable development and the impact of various teaching styles and approaches on student learning and the development of sustainability consciousness.

CHAPTER 3

RESEARCH METHODOLOGY

3.1   Introduction

This chapter involves a detailed overview of the research approach and design for current research, the population of research and sample selection, research instrument, methods for data collection, and data investigation. Section 3.2 and 3.3 discusses the details of the research philosophy and research approach of the current study respectively. Section 3.4 addresses the research design, similarly, Section 3.5 and 3.6 addresses research instruments and verification of tools respectively. Section 3.7 discusses the research population, while section 3.8 and 3.9 provides an overview of the sampling technique. Section 3.10 and 3.11 provide details of collected data and statistical inquiry used in current research. While, in section 3.12 and 3.13 covers the ethical considerations and a brief summary of chapter 3.

3.2   Research Philosophy

The Research philosophy is the combination of ideas and assumption about the Knowledge creation. It specifies how data should be collected, evaluated, and used during the study process (Saunders et al., 2009). According to Burrel and Morgan (2017) researchers make different assumptions about realities which researcher encounters (ontological assumptions), human knowledge (epistemological assumptions), and values and beliefs of the researcher (axiological assumptions) during various phases of investigation process.

The current research was conducted under the paradigm of pragmatism. Pragmatism tried to reconcile the ideas and values of both objectivism and subjectivism.

Pragmatism is often associated with mixed methods research, which involves combining both qualitative and quantitative approaches in the study of a particular topic or problem. In this study, teaching styles and sustainability consciousness have been studied through both quantitative and qualitative strands (Cohen et al., 2007). Kalsoom (2017) argues that sustainability consciousness is not an inherent characteristic, but rather it is shaped by the context and the individual's mindset. Therefore, it is necessary to examine both sides of the research coin in order to fully understand this concept. The perception of students about their educators' teaching styles cannot be accurately measured solely through fixed assessment criteria. It is necessary to provide an open forum for students to share their subjective views on the subject.

As San Luis and Cañadas, (2014) argued that when evaluating a teacher, it is essential to prioritize the perspectives and experiences of the students. In addition to considering objective measures of teaching, it is also important to consider subjective elements such as the teacher's personal approach and style. Furthermore, the survey component of the study focused on how different teaching styles at the classroom level influence students' attitudes towards their teachers and learning, as well as their behavior at the individual level. To gain more in-depth understanding, the qualitative portion of the study involved focused groups with students to explore their experiences and determine which specific teacher practices are perceived to impact their attitudes (Grecu et al., 2022).

According to Maxwell (2004), researchers are not required to fully adhere to a single paradigm or tradition and can instead incorporate elements from various approaches. Maxwell states, "it is possible to combine aspects of different paradigms and traditions" (p. 37). Therefore, a scientific quantitative approach was used to uncover the objective reality of the situation, as perceived by the students about their

educator teaching styles. This method involves a separation between the researchers and the phenomena being studied, with the goal of discovering the truth in an objective manner. On the other hand, qualitative research, such as interviews, acknowledges that there may be multiple truths that are grounded in subjective experiences. This approach involves interaction between the researcher and the phenomenon being studied. In this research, there is an element of interaction between the researcher and the phenomenon being studied. Both quantitative and qualitative research methods have their own advantages: while quantitative data provides objective and immediate results, qualitative data offers in-depth analysis. Both approaches can be used together to gain a more comprehensive understanding of the topic (Johnson & Onwuegbuzie, 2004).

3.3   Research Approach

The present study aims to investigate the status of teacher-educators' teaching styles and sustainability consciousness of student-teachers with respect to Education for Sustainable Development (ESD). The purpose of this research is to explore the impact of teacher-educators' teaching styles on student-teachers' sustainability consciousness. The researcher has chosen a mixed-method research approach to conduct this study. Mixed methods can be characterized as a research approach where the researcher employs both qualitative and quantitative techniques in the data collection and analysis process, with the goal of integrating the results and arriving at conclusions in a single study (Tashakkori & Creswell, 2007). The combination of different data sets can result in a more comprehensive understanding of the research problem and produce more comprehensive evidence. This allows the researcher to obtain both depth and breadth in their analysis. Combining numerical data with qualitative themes can help prevent over-reliance on statistics and can also bring to light the "soft-core views and experiences," which play an important role in understanding

complex social circumstances (Jogulu & Pansiri, 2011). By using both qualitative and quantitative data, the researcher can strengthen the findings and increase the reliability and validity of the results. From a philosophical viewpoint, the mixed method approach blends different perspectives and enables researchers to blend theory development and hypothesis testing in a single study (Jogulu & Pansiri, 2011). The mixed method approach allows the researcher to adjust the research design and data collection methods based on the findings obtained during the study. Mixed methods are particularly useful when the research question is complex, multidisciplinary, or research on complex social issues that cannot be answered using either qualitative or quantitative methods alone.

3.4   Research Design

A mixed-methods study blends quantitative and qualitative research methodologies, concepts, approaches, and languages into a single investigation (Johnson, 2004 p.17). A mixed approach is a research strategy that makes use of both qualitative and quantitative data (Zina, 2021). The current study used simultaneous quantitative and qualitative design (Morse, 1991). According to Teddlie and Tashakkori (2009), we might refer to this design as a parallel mixed design. It is also known as convergent design (Creswell, 2014).

3.4.1   Convergent Parallel Design

In mixed method approach, the convergent parallel mixed methods design was utilized to collect data. This research approach is employed when both the quantitative and qualitative strands are implemented concurrently. According to Creswell (2014), Researchers can blend qualitative and quantitative data into their data analysis and interpretations using a Convergent Mixed Method Design to provide a more

comprehensive view of a phenomenon under study (Creswell, 2014). In light of this, convergent parallel design was used to present a more complete view of teacher-educators teaching styles and student-teachers SC.

In this approach, the researchers usually gather both types of data simultaneously, give equal weight to each method, maintain the independence of data analysis, combine the results during the overall interpretation, and look for convergence, divergence, contradictions, or relationships between the two sources of data (Bano, 2020).

The convergent parallel investigation offers a thorough comprehension of the issue. While qualitative results offer detailed individual points, quantitative data offer broad correlations and inclinations (Creswell & Creswell, 2014). When both qualitative and quantitative strands are applied simultaneously, this research design is used. This concept is built on two phases that can be Qual and Quan phases: first, Quan, and second, Qual. Quan and Qual are occasionally performed together at brief intervals throughout each phase.

During the first step, which is quantitative, data is gathered and examined separately. During the second stage, which is qualitative, data is gathered and analyzed separately. In the Quan phase, the researcher tests theories, and respond to research questions in the Qual phase (Morse, 1991). Parallel mixed is represented as Qual + Quan or Quan + Qual in the Morse concept system. Both Quan and Qual provide answers to fundamental research issues before integrating their findings. When quantitative factors predominate in a design, Quan + Qual is used to indicate this (Graff, 2016).

There are explanations for many simultaneous designs in (Morse, 1991).

1.   Quan + Quan stands for simultaneous quantitative design that is quantitatively focused.

2.   Qual + Qual refers for simultaneous qualitative design that is qualitatively focused.

3. Qual + Quan indicates for simultaneous qualitative and quantitative design as well as qualitatively focused design.

4. The phrase "Quan + Qual" means for simultaneous qualitative and quantitative design.

The current study used a simultaneous Quan + Qual design, i.e., it was conducted using questionnaire and interview. This design is divided into two phases. One of the parts is the QUAL phase, while the other is the QUAN phase, or it might be both. The QUAL and QUAN procedures are often performed concurrently, and occasionally with a short time delay between each phase. The two phases of the research do not constraint each other. The one part involves QUAN (quantitative) distinct data gathering and analysis, whereas the other part QUAL (qualitative) requires distinct data collection and analysis. Both stages are planned and agreed upon to answer comparable components of the central research topic. The "convergent parallel approach" is employed in thesis writing when data is gathered, processed, and combined only at the data interpretation or discussion stage.

Figure 3.1

Convergent Parallel Mixed Design
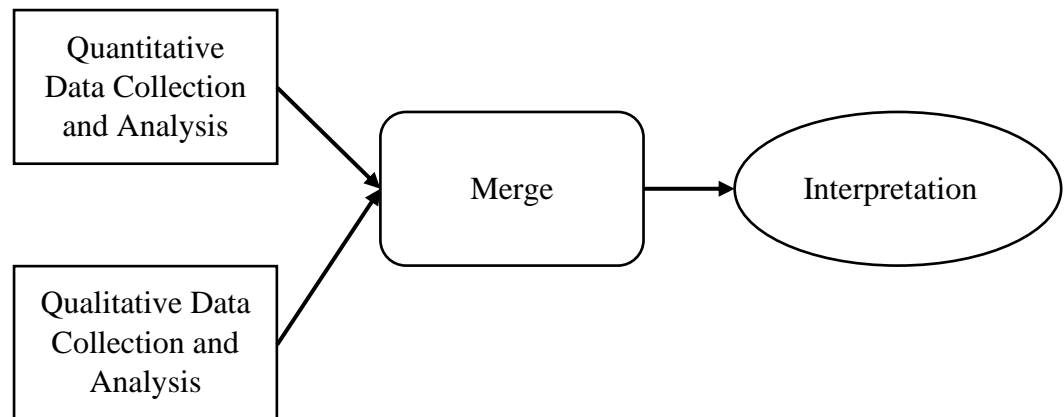
3.5 Research instruments

Two survey scales were utilized to assess student-teachers SC and teacher-educator teaching style. The details of the instruments used in the current study are given below. Similarly, the interviews were conducted in a semi-structured manner to get a deeper insight into teacher-educators teaching styles and their SC pertinent to SD, ESD, or EE.

3.5.1 Teaching Styles Questionnaire.

The current study utilized the Teaching Styles questionnaire in perspective of student-teachers rooted in Grasha's Teaching Styles framework. The researcher adapted Grasha's teaching styles' inventory in Pakistani context. Grasha (1996) measured five teaching styles i.e., i) Expert, ii) Formal Authority iii) Personal Model iv) Facilitator, and v) Delegator. The TSI is a well-known and one of the most extensively used instrument for assessing teaching styles (Thigpen, 2012). The teaching style tool consists of 40 items measuring the aforementioned five teaching styles. A five-point Likert scale was used to rate each statement, with "1" indicating strongly

disagree and "5" indicating strongly agree. Eight questions were used to measure each teaching style. The details of the teaching styles' inventory are provided in the appendix (B). Grasha argues that teaching style indicates the permanent personal characteristics that show up in how we instruct our students, and that this has an impact on students' learning abilities. The data on teaching styles were collected from students, Because of considerations about confidentiality and social desirability bias; it was decided to require learners to complete the whole survey. Asking instructors to assess their own teaching might jeopardize their teaching responsibility, negatively affecting students' survey responses. In addition, because students can fill in the questionnaire anonymously, they will be less cautious when evaluating teachers' instruction as well as their own performance (Tang et al., 2020).

Hence, the data pertinent to teacher-educator teaching styles was collected from the respective student-teachers who can anonymously evaluate teacher-educator teaching styles. The survey was utilized to get responses from the student-teachers regarding their perception of their respective teacher teaching style.

A few changes were made to the original inventory in order to use it for data collection from the student-teachers regarding their teacher teaching style. For example, the original item was "I establish high expectations for students in this class" was changed to "the instructor sets high standards for students in this class." The details of the teaching style inventory for student-teachers are provided in the appendix "B".

3.5.2 Sustainability Consciousness Questionnaire.

The current study utilized the sustainability consciousness questionnaire rooted in Gericke et al. (2019) framework. The researcher adapted the Gericke et al. (2019) questionnaire, namely the sustainability consciousness questionnaire (SCQ) to assess the student-teachers' SC. The researcher permission was sought out before using the

scale. The original scale had a few negative items. The researcher kept them as it is to reduce erroneous responses. The SCQ was developed in two versions, i.e., sustainability consciousness questionnaire long (SCQ-L) and sustainability consciousness questionnaire short (SCQ-S). The SCQ-L was developed to measure students' knowingness, attitude, and behavior towards three pillars of SD i.e., i) environment, ii) social and iii) economic dimensions. The SCQ-L have three dimensions i.e., i) sustainability knowingness, ii) sustainability attitude, and iii) sustainability behavior. Moreover, each scale consists of three sub-dimensions resulting in a total of nine sub-dimensions. The SCQ-L consists of 48 items measuring three second-order constructs and nine first-order constructs. Student-teachers' knowingness regarding the environment, society, and economy was assessed through six, eight, and four items respectively. Similarly, attitude towards the environment, society, and economy was assessed through four, six, and four items respectively. Moreover, behavior towards the environment, society, and economy was assessed via seven, six, and four items respectively. Using a 5-point Likert scale, the responses from undergraduates were evaluated, where 1 represent strongly disagree and 5 represent strongly agree. The details of the SCQ-L are provided in appendix "C".

3.5.3 **Interviews**

Although close-ended questionnaires provide useful information regarding the student-teachers' perception of teacher-educators teaching style in the classroom, but to get a deep insight into the variable under study, the current research utilized a semi-structured interview technique. The interview protocols were prepared after a comprehensive literature review (see Appendix D). The semi-structured interviews enabled more in-depth conversations. According to Gall et al. (2007), semi-structured

interviews involve asking a handful of structured questions before delving further with open-ended inquiries to gather more information.

3.6 Verification of Tool

3.6.1 **Pre-test**

One of the methods for the verification of the research instrument is the pre-test method which is usually carried out with a few people (individuals, professionals, etc.) in order to detect problems in the survey design or structure of the questionnaire. One way of the pre-test is to involve professionals/experts in the screening process who identify issues such as sentence structure, content validity, appropriateness of the statements. The current research involved five experts in the field of SD, statistics, linguistics, and education in order to screen the research instrument and assess the appropriateness of the research tool.

The scale was presented to experts in the field to ensure the face validity. The experts suggested to simply the language of the questionnaire in order to enhance the understandability for the students. The researcher made necessary changes and represented the questionnaire to experts in order to get their expert opinion on the subject questionnaire. Language of the questionnaire was changed in a way that the meaning of the questionnaire conserve. For example, in the original questionnaire the item was posed as "For sustainable development, people need to be educated in how to protect themselves against natural disasters", however, in current research the question was rephrased as "for sustainable development, people need to be educated about natural disasters". Similarly, another item was posed as "Reinforcing girls' and women's rights and increasing equality around the world is necessary for sustainable development" which was rephrased to the statement as "reinforcing women's rights and

equality is necessary for sustainable development". The expert provided with a few more structural changes which were incorporated as suggested.

The feedback provided by the experts indicates that the items of the survey are relevant and understandable establishing the face validity of the research instrument. Similarly, Interview protocols were forwarded to those experts for feedback. The experts suggested a few changes that were incorporated in the final instrument.

3.6.2 Exploratory Factor Analysis

The construct validity of research tools that have been used for the present research were also validated through Exploratory Factor Analysis (EFA). According to Balqis-Ali, et al. (2021) it is suggested that when changes are made to the original scale (with permission) or when it is used in a different setting than its original development, the researcher should evaluate the psychometric properties and underlying patterns before applying it to the selected sample. Therefore, Exploratory factor analysis technique was used to validate the research Tools in Pakistani context.

The first step in the EFA is the assessment of the correlation matrix. The correlation matrix is evaluated using Bartlett's Test of Sphericity, which assumes that the correlation matrix is an identity matrix (null hypothesis). The significance value of 0.05 suggest no correlation exist and resultant correlation matrix is an identity matrix. On contrary, significance value less than 0.05 suggest correlation exist and the resulting correlation matrix is not an identity matrix The Bartlett's Test significance value suggest that significant correlation exist between the items of the scale i.e., $p < 0.001$. Moreover, the value of Kaiser-Meyer-Olkin (KMO) also indicates that an adequate sample was selected for the data collection.

Table 3.1

KMO and Bartlett's Test

KMO		.913
	Approx χ^2	11302.647
Bartlett's Test	df	780
	significance.	0.000

The principal component extraction technique with varimax rotation was utilized on the 40 items to extract the number of common factors based on the eigenvalues of greater than one. The total variance explained table indicates that the principal component extraction method extracted five factors similar to the original scale having an eigenvalue greater than one and explaining 68.42% variation in the scale.

Table 3.2

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% Of Var	Cum %	Total	% Of Var	Cum %	Total	% Of Var	Cum %
1	9.68	24.20	24.20	9.68	24.20	24.20	6.06	15.14	15.14
2	5.64	14.09	38.29	5.64	14.09	38.29	5.49	13.72	28.87
3	5.24	13.09	51.38	5.24	13.09	51.38	5.33	13.31	42.18
4	3.87	9.68	61.06	3.87	9.68	61.06	5.30	13.25	55.43
5	2.94	7.36	68.42	2.94	7.36	68.42	5.20	12.99	68.42
6	0.81	2.02	70.44						
7	0.72	1.80	72.24						
8	0.71	1.78	74.02						
9	0.66	1.64	75.66						
10	0.61	1.52	77.18						
11	0.57	1.43	78.61						
12	0.54	1.36	79.97						
13	0.52	1.29	81.26						

14	0.50	1.25	82.51
15	0.47	1.17	83.68
16	0.46	1.14	84.82
17	0.44	1.11	85.92
18	0.41	1.01	86.94
19	0.40	0.99	87.93
20	0.39	0.96	88.89
21	0.37	0.93	89.81
22	0.35	0.86	90.68
23	0.32	0.80	91.48
24	0.31	0.78	92.25
25	0.31	0.76	93.01
26	0.30	0.75	93.76
27	0.28	0.69	94.45
28	0.27	0.67	95.12
29	0.25	0.63	95.74
30	0.22	0.55	96.29
31	0.22	0.54	96.83
32	0.20	0.50	97.33
33	0.19	0.48	97.81
34	0.17	0.43	98.23
35	0.16	0.39	98.63
36	0.14	0.36	98.98
37	0.13	0.33	99.31
38	0.12	0.29	99.60
39	0.08	0.21	99.80
40	0.08	0.20	100.00

The factor loadings obtained from the EFA were analyzed for the dimensions of the teaching styles and to eliminate the factors loadings that did not load properly on the respective dimensions. There are multiple thresholds given in the literature ranging between 0.50 to 0.70. However, the current research utilized a relatively strict threshold i.e., 0.70 as an acceptability criterion to include items in the analysis. The results in the

rotated component matrix suggest that all the items have met the minimum threshold of 0.70 and are perfectly loading on the respective dimensions as well. The rotated component matrix also suggests a five-factor solution. Hence, all the items in the analysis were retained and will be used in further analysis.

Table 3.3

Rotated Component Matrix

	Component				
	1	2	3	4	5
ETS_1	0.818				
ETS_2	0.809				
ETS_3	0.726				
ETS_4	0.789				
ETS_5	0.825				
ETS_6	0.773				
ETS_7	0.731				
ETS_8	0.921				
FATS_1		0.744			
FATS_2		0.801			
FATS_3		0.868			
FATS_4		0.828			
FATS_5		0.855			
FATS_6		0.790			
FATS_7		0.705			
FATS_8		0.815			
PMTS_1			0.715		
PMTS_2			0.856		
PMTS_3			0.800		
PMTS_4			0.763		
PMTS_5			0.810		
PMTS_6			0.841		
PMTS_7			0.714		
PMTS_8			0.918		

FTS_1	0.835	
FTS_2	0.830	
FTS_3	0.853	
FTS_4	0.871	
FTS_5	0.852	
FTS_6	0.774	
FTS_7	0.735	
FTS_8	0.926	
DTS_1		0.817
DTS_2		0.842
DTS_3		0.799
DTS_4		0.790
DTS_5		0.716
DTS_6		0.704
DTS_7		0.705
DTS_8		0.885

3.6.2.1 Sustainability Consciousness

KMO Measure of Sampling Adequacy values over 0.5 indicate adequacy of sample and usefulness of the results of factor analysis. The values in the table below i.e., $0.81 > 0.50$ indicate sampling adequacy for factor analysis. Moreover, the values of Bartlett's Test of Sphericity suggest the correlation matrix is not an identity matrix and correlation exist between the items of the scale i.e., $p < 0.001$.

Table 3.4.

KMO and Bartlett's Test

KMO Measure of Sampling Adequacy.		.841
Bartlett's Test of Sphericity	Approx χ^2	10385.083
	Df	1128
	significance.	.000

The principal component extraction technique with varimax rotation was utilized on the 48 items to extract the number of common factors based on the eigenvalues > 1. The total variance explained table indicates that the principal component extraction method extracted nine distinct factors similar to the original scale having an eigenvalue greater than one. Moreover, the results in the table below indicate that these nine factors explain 69 percent variation in the scale.

Table 3.5

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% Of Var	Cum %	Total	% Of Var	Cum %	Total	% Of Var	Cum %
1	6.22	12.95	12.95	6.22	12.95	12.95	5.45	11.36	11.36
2	4.58	9.54	22.49	4.58	9.54	22.49	4.15	8.64	20.01
3	4.18	8.70	31.18	4.18	8.70	31.18	3.98	8.30	28.30
4	4.12	8.59	39.77	4.12	8.59	39.77	3.98	8.30	36.60
5	3.72	7.74	47.51	3.72	7.74	47.51	3.96	8.25	44.85
6	2.84	5.92	53.43	2.84	5.92	53.43	3.01	6.28	51.13
7	2.70	5.63	59.06	2.70	5.63	59.06	2.99	6.23	57.36
8	2.42	5.04	64.10	2.42	5.04	64.10	2.74	5.71	63.06
9	2.21	4.61	68.71	2.21	4.61	68.71	2.71	5.65	68.71
10	0.84	1.75	70.46						
11	0.78	1.62	72.08						
12	0.69	1.44	73.53						
13	0.65	1.34	74.87						
14	0.62	1.30	76.16						
15	0.61	1.27	77.43						
16	0.58	1.20	78.63						
17	0.55	1.15	79.78						

18	0.54	1.13	80.91
19	0.52	1.07	81.98
20	0.50	1.04	83.02
21	0.48	0.99	84.01
22	0.45	0.94	84.95
23	0.43	0.90	85.85
24	0.43	0.90	86.75
25	0.41	0.85	87.60
26	0.39	0.81	88.41
27	0.38	0.79	89.20
28	0.36	0.74	89.94
29	0.34	0.71	90.65
30	0.33	0.68	91.33
31	0.31	0.65	91.98
32	0.31	0.64	92.62
33	0.30	0.63	93.24
34	0.30	0.62	93.86
35	0.28	0.59	94.45
36	0.28	0.58	95.03
37	0.26	0.55	95.58
38	0.25	0.53	96.10
39	0.25	0.51	96.62
40	0.23	0.49	97.10
41	0.22	0.46	97.56
42	0.21	0.44	98.00
43	0.20	0.42	98.42
44	0.19	0.40	98.81
45	0.19	0.39	99.20
46	0.18	0.38	99.59
47	0.15	0.30	99.89
48	0.05	0.11	100.00

The results of the exploratory factor analysis using a varimax rotation technique are given below. The results indicate that the SC scale preserves its psychometric properties in Pakistani context as well. All the loadings were placed on their appropriate dimensions. Not only that, but all items' factor loadings were over the cutoff value of 0.70. That's why none of the item was deleted, and everything was kept as it was.

Table 3.6

Rotated Component Matrix

	Component								
	1	2	3	4	5	6	7	8	9
Env_Know_1	0.803								
Env_Know_2	0.829								
Env_Know_3	0.819								
Env_Know_4	0.787								
Env_Know_5	0.815								
Env_Know_6	0.797								
Soc_Know_1		0.811							
Soc_Know_2		0.843							
Soc_Know_3		0.825							
Soc_Know_4		0.844							
Soc_Know_5		0.806							
Soc_Know_6		0.784							
Soc_Know_7		0.798							
Soc_Know_8		0.784							
Eco_Know_1			0.832						
Eco_Know_2			0.861						
Eco_Know_3			0.863						
Eco_Know_4			0.820						
Env_Att_1				0.774					
Env_Att_2				0.863					
Env_Att_3				0.849					

Env_Att_4	0.861		
Soc_Att_1		0.867	
Soc_Att_2		0.758	
Soc_Att_3		0.772	
Soc_Att_4		0.764	
Soc_Att_5		0.802	
Soc_Att_6		0.799	
Eco_Att_1			0.793
Eco_Att_2			0.832
Eco_Att_3			0.874
Eco_Att_4			0.747
Env_Beh_1			0.911
Env_Beh_2			0.831
Env_Beh_3			0.795
Env_Beh_4			0.743
Env_Beh_5			0.79
Env_Beh_6			0.77
Soc_Beh_1			0.726
Soc_Beh_2			0.794
Soc_Beh_3			0.792
Soc_Beh_4			0.947
Soc_Beh_5			0.909
Soc_Beh_6			0.755
Eco_Beh_1			0.846
Eco_Beh_2			0.808
Eco_Beh_3			0.784
Eco_Beh_4			0.817

3.6.3 Reliability of research tools

3.6.3.1 Reliability of quantitative research tools

Once the content of the research tool i.e., survey was finalized, the next step was to conduct to refine the questionnaire and to assess the internal consistency of the

items. Given this, a sample of 100 respondents was selected and a questionnaire was floated among the student-teachers for improvement and refinement of the survey questionnaire. The respondents were selected from a relevant population however, these respondents were not included in the final sample for the current study. The respondents of the pilot study were asked for their consent. Once they provide their consent, student-teachers were provided with the determination of the research, a full questionnaire, and assurance of privacy.

The questionnaire contains four sections. The first section of the questionnaire was about the respondent's demographical profile and contains questions related to their age, gender, university, semester, and origin. The second section was about the teacher-educator teaching styles containing questions related to the five teaching styles namely expert, formal authority, personal model, facilitator, and delegator. The third section was pertinent to the student-teacher SC measuring the student-teachers sustainability knowingness, attitude, and behavior towards environment, society, and economy respectively.

The preliminary investigation of the data collected over the pilot survey suggests that all the variables and their dimensions bear a good internal consistency/reliability score i.e., all the variables and dimensions' reliability score is greater than 0.70 which exhibits internal uniformity and consistency of the items for measuring variables. The outcomes of the reliability analysis are given in the table below.

Table 3.7

Item Correlation of Teaching Styles Scale (N=100)

Items	Correlation	Items	Correlation
Exp_1	.746**	PM_5	.740**
Exp_2	.795**	PM_6	.692**
Exp_3	.803**	PM_7	.783**
Exp_4	.689**	PM_8	.749**
Exp_5	.759**	Fac_1	0.65**
Exp_6	.795**	Fac_2	0.80**
Exp_7	.768**	Fac_3	0.75**
Exp_8	.769**	Fac_4	0.75**
FA_1	.707**	Fac_5	0.71**
FA_2	.733**	Fac_6	0.79**
FA_3	.703**	Fac_7	0.80**
FA_4	.702**	Fac_8	0.77**
FA_5	.791**	Del_1	.721**
FA_6	.804**	Del_2	.732**
FA_7	.799**	Del_3	.697**
FA_8	.767**	Del_4	.668**
PM_1	.707**	Del_5	.695**
PM_2	.728**	Del_6	.737**
PM_3	.678**	Del_7	.682**
PM_4	.809**	Del_8	.750**

The item rest correlation method was applied to calculate the internal consistency of the teaching styles scale. In reliable scales, Field (2009) said that all scale elements should be connected with the overall score. Threshold for the correlation was 0.3 and any value above the threshold represent acceptable correlation. Zijlmans et al. (2018) also highlighted the threshold value for item-rest correlation should be 0.30 whereas it should be .40 for the performance test in their research study. The TTS items correlation values of all statements range from .0.65 to .809 which is higher than .40.

Table 3.8

Item Correlation of SC Scale, N=100

Item	Correlation	Item	Correlation
EnK1	0.760^{**}	EcAt1	0.721^{**}
EnK2	0.759^{**}	EcAt2	0.795^{**}
EnK3	0.755^{**}	EcAt3	0.785^{**}
EnK4	0.738^{**}	EcAt4	0.772^{**}
EnK5	0.759^{**}	EnB1	0.726^{**}
EnK6	0.755^{**}	EnB2	0.683^{**}
SK1	0.794^{**}	EnB3	0.679^{**}
SK2	0.700^{**}	EnB4	0.672^{**}
SK3	0.720^{**}	EnB5	0.783^{**}
SK4	0.708^{**}	EnB6	0.717^{**}
SK5	0.711^{**}	EnB7	0.747^{**}
SK6	0.697^{**}	SoB1	0.721^{**}
SK7	0.689^{**}	SoB2	0.786^{**}
SK8	0.768^{**}	SoB3	0.732^{**}
EcK1	0.722^{**}	SoB4	0.726^{**}
EcK2	0.766^{**}	SoB5	0.781^{**}
EcK3	0.739^{**}	SoB6	0.715^{**}
EcK4	0.723^{**}	EcB1	0.791^{**}
EnAt1	0.738^{**}	EcB2	0.576^{*}
EnAt 2	0.766^{**}	EcB3	0.781^{**}
EnAt 3	0.724^{**}	EcB4	0.641^{**}
EnAt 4	0.703^{**}		
SoAt1	0.733^{**}		
SoAt2	0.794^{**}		
SoAt3	0.782^{**}		
SoAt4	0.751^{**}		
SoAt5	0.768^{**}		
SoAt6	0.786^{**}		

The internal consistency of the scale was determined using the item rest correlation approach. According to Field's (2009) analysis, all scale components should

be linked to the final result in reliable scales, Problematic items may be eliminated if the correlation is less than 0.3. According to Zijlmans et al. (2018), the threshold value for item-rest correlation should be 0.30, but it should be 0.40 for the performance test in their research study. All statements' SCQ items correlation values vary from.0.57 to.704, which is greater than.40.

Table 3.9

Overall Reliability Analysis

Variable	Total Items	Cronbach Alpha
Teaching Style	**40**	**0.930**
Expert	8	0.728
Formal Authority	8	0.760
Personal Model	8	0.794
Facilitator	8	0.814
Delegator	8	0.873
Sustainability Consciousness	**48**	**0.944**
Environmental Knowingness	6	0.701
Social Knowingness	8	0.814
Economic Knowingness	4	0.809
Environmental Attitude	4	0.735
Social Attitude	6	0.715
Economic Attitude	4	0.742
Environmental Behavior	6	0.785
Social Behavior	6	0.791
Economic Behavior	4	0.721

3.6.3.2 Pilot testing of interviews

Four participants were selected for pilot testing of qualitative data tool. These participants were not included in the final interview. To check whether the researcher could finish each interview in under 30 minutes, the researcher

timed them throughout the pilot. During piloting, it was found that 27 minutes was the bare minimum for an interview. After completing the interview notes (including translating the participants' responses from Urdu to English), the researcher gave them to the participants to see whether they agreed with the researcher transcription and understanding. The purpose of the pilot study was to calculate the questions' applicability and to make some initial suggestions regarding the feasibility of the research. It also made it simpler for the researcher to build relationships with the informants and gain experience conducting semi-structured interviews. Notably, the researcher was able to improve interviewing methods and communication flow thanks to the pilot study.

3.7   Research Population

Population refers to the entire group of participants in a study that a researcher chooses in order to carry out the study and meet the established research objectives (Ilyas, 2022). The population of the study included all the student- teachers of undergraduates' programs. Teacher education was chosen as a research focus because it is a key area in ESD (UNESCO, 2005, 2014; Buckler & Creech, 2014; Tilbury, 2011; McKeown, 2014, 2002). Moreover, Considering the resource and time constraints only those student-teachers were selected, who were enrolled in the undergraduate teacher-education programs i.e., BS (Hons) and B.Ed. (Hons.) in the public sectors institutions of Rawalpindi and Islamabad. The purpose for include just the public sector was to restrict the study and eliminate any discrepancies because of socioeconomic inequalities among pupils. The total population of undergraduate four years programs students was nineteen hundred and eighty-six. To find out the total population, the researcher first gathered the list of attendance sheets from the several departments, and

then summed their total numbers to get the entire population. The details of the population are given in the figure below.

Figure 3.2

Population of the study
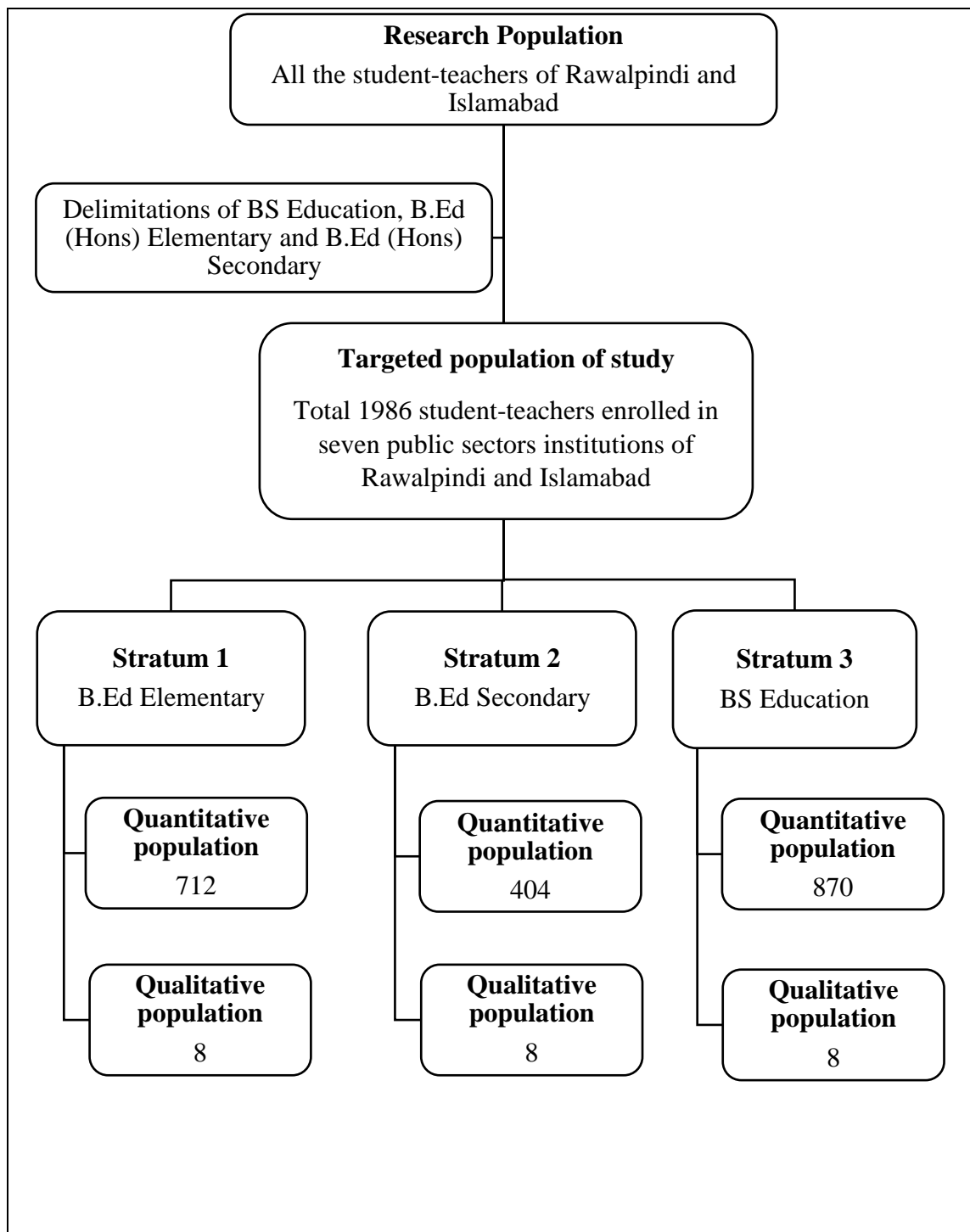
3.8 Sample and Sampling Technique

The current research utilized stratified random sampling technique. Stratified random sampling is a sampling technique in which the population is divided into strata, or subgroups, based on shared characteristics. The goal of stratified sampling is to ensure that the sample is representative of the larger population with regard to the attribute being used to divide the population. This is accomplished by randomly selecting a sample from each stratum, rather than sampling randomly from the entire population.

To implement this sampling method, the researcher first identified an attribute that would be used to divide the population into strata. This could be any characteristic that is relevant to the research question and that can be easily distinguished within the population. As Kumar (2018) notes, it is crucial that the characteristics selected as the foundation for stratification can be easily distinguished within the research population in order to ensure the integrity of the sampling process (p. 203). For example, the investigator might choose to stratify the population by academic program, year of study, college/university, or geographical location. Once the attribute for stratification has been identified, the current study selected strata based on the educational institutions and year of study. It is important that the characteristics selected as the foundation for stratification can be easily distinguished within the research population, as this will help ensure the integrity of the sampling process. Once the strata have been created, the researcher selected the sample from each stratum randomly.

Determining an appropriate sample size for a research study is an important step in the research process. It helps to ensure that the results of the study are accurate and statistically significant. Cohen et al., (2017) provided a table to determine the appropriate sample size. It's worth noting that the sample size can also be influenced by

other factors, such as the size of the population and the degree of precision desired. According to Burton (2015), research can be undertaken using a selection of sample between 20 and 75 percent of the overall population, although the optimal sample size will depend on the specific research question and the characteristics of the population being studied.

Once the sample size had been determined, the researcher prepared a list of the population based on data provided by the university administration. The population was then divided into strata based on the year of study and the educational institution and selected a proportionate sample of 50% of student-teachers from each stratum. Each student was assigned a number, and the final sample was chosen using a simple random table. The details of the strata are also given below.

Table 3.10

Sample Size

Sr.#	Institutions	Years				Total
		1	2	3	4	
1.	Institution 1	58	57	65	25	205 (20.64%)
2.	Institution 2	26	25	21	22	94 (9.47 %)
3.	Institution 3	46	25	15	27	113 (11.38%)
4.	Institution 4	28	22	18	10	78 (7.85%)
5.	Institution 5	35	30	25	24	114 11.48%)
6.	Institution 6	67	29	66	72	234 (23.56%)
7.	Institution 7	45	58	41	11	155 (15.61%)
	Total	**305**	**246**	**251**	**191**	**993 (100%)**

3.9 Data Collection

The current research utilized a mix-method approach for data collection i.e., both research questionnaires and semi-structured interviews for data collection. Approval from the concerned authorities and consent of the individual respondents was

sought out before the collection of the data. The data were collected in three phases. The detail of the data collection is provided in the following paragraphs.

3.9.1   Data Collection for pilot testing

The first phase of the data collection was aimed at validating the teaching styles inventory developed by Grasha. For this purpose, 2 universities offering teacher-education programs in Rawalpindi region were selected for data collection which was not part of the final sample. First, the respective heads of the concerned departments were contacted via email stating the purpose of the current research and to seek permission for data collection from the student-teachers. Once the permission was sought out, an email along with the purpose and questionnaire (google form link) was forwarded to all the concerned department representatives to further distribute it among student-teachers using available platforms. The questionnaire was distributed among the student-teachers enrolled in the BS (Hons) in Education program and studying courses teaching of contemporary issues and trends in education, social studies, Pakistan studies, and environmental education in these two public sector universities.

3.9.2   Quantitative data

During the second phase, student-teachers studied courses namely social studies, contemporary trends and issues in education, environmental education, and Pakistan studies were selected from seven public sector institutions. Based on this, the data were collected from the student-teachers regarding their teacher-educator teaching styles and their SC. During this stage, the survey questionnaire was distributed among the student-teachers. The researcher personally visited the universities after sorting permission from the respective universities and head of departments. In some Universities, the researcher personally distributed questionnaire among the student-

teachers, while in other, questionnaire was distributed by a designated representative by the department of the concerned university.

The survey was started from 15th of December 2021 till April 2022. Overall, a sample of 993 student-teachers was selected for data collection. The questionnaires were distributed among the student-teachers in Rawalpindi and Islamabad Region. The researcher targeted half of the population available, however, due to unavailability of few student-teachers, only 905 questionnaires were distributed among the student-teachers. Out of these 905 questionnaires, 832 were returned to the researcher. Out of 832 responses received, 54 questionnaires were not filled completely, while 25 questionnaires had to be excluded as outliers based on the box plot analysis.

The researcher also excluded observations with missing data from the analyses. As an outcome, 753 responses returned were used for inquiry, with net response rate of 75.83%. Similarly, 227 (30.1%) student-teachers' were studying in their 1st year, 183 (24.3%) in 2nd year, 204 (27.1%) in 3rd year, and 139 (18.5%) in 4th year. The participants ages ranges between 19 to 28 years. As Baruch and Neuman (2014) explained, the response rate between 10 and 50% is thought to be fair in academic research studies employing questionnaires as a tool. As a result, the response rate of questionnaires is likewise reasonable.

Table 3.11

Rate of Return Response

S No	Universities	Total Sample Years				Total	Rate of Return Response Years				Total
		1	2	3	4		1	2	3	4	
1	Institution 1	58	57	65	25	**205**	46	50	49	25	**170**
2	Institution 2	26	25	21	22	**94**	19	14	19	8	**60**
3	Institution 3	46	25	15	27	**113**	33	14	17	15	**79**
4	Institution 4	28	22	18	10	**78**	15	19	11	8	**53**
5	Institution 5	35	30	25	24	**114**	25	22	21	16	**84**
6	Institution 6	67	29	66	72	**234**	57	18	53	57	**185**
7	Institution 7	45	58	41	11	**155**	32	46	34	10	**122**
	Total	**307**	**250**	**257**	**199**	**993**	**227**	**183**	**204**	**139**	**753**

Moreover, out of 753 participants, 185 (24.57%) participants were male while 568 (75.43%) were female. This disparity in male to female in teacher-education has been described in the researcher works (Kalsoom et al., 2017).

Table 3.12

Total Number of Respondents Based on Gender.

S No	Gender	Number of students
1	Male	185
2	Female	568
Total		**753**

Table 3.13

Total Number of Respondents Based on Program.

	Classes	Number of students
1	BS Education	355
2	B.Ed Elementary	276
3	B.Ed Secondary	122
Total		**753**

3.9.3 **Qualitative data**

For the third phase, student-teachers were interviewed to get a deep insight into the student-teachers understanding of the SD and its facets, teaching style and SC constructs, and how they perceived the relationship between teaching style and SC. For this purpose, only those student-teachers who studied courses namely teaching of social studies, contemporary issues and trends in education, environmental education, and Pakistan studies were selected for the interviews. Respondents were selected using a Random Sample technique. A total twenty-five students were randomly selected for the interview.

The selected respondents were not included in quantitative data collection phase. The respondents were informed regarding the objectives of this phase and were asked to provide consent for the semi-structured interview. According to Creswell (2014), the amount of saturation is critical in qualitative research. If the threshold of saturation is reached for qualitative approaches, the study goal is attained. As a result, 17 students were questioned at random before the saturation level attained.

The participants who consented to the interview were asked for an online interview using online meeting platforms like Google Meet, Zoom, Skype, etc. The interviews were scheduled as per the convenience of the respondents. The interviews were recorded after permission was sought out. However, to ensure confidentiality and as an ethical obligation, all the participants were ensured no data will be publicly available for any purpose. The majority of the responses were provided in Urdu. After the interviews, the researcher transcribed the interviews into English. After transcription, the responses were shared with the respondent in order to attain their feedback on the interview transcription. Respondents provided their feedback where they saw fit. Some of the interviewees requested that the researcher to add a few

additional points which were added consequently. The researcher urged them to do so because he believed it would improve the data. It took 20 – 28 minutes to complete an interview.

3.10 Data Analysis

3.10.1 Quantitative analysis

The current research utilized a mix-method technique for data collection. Quantitative data was recorded in an excel sheet. Inferential statistics were applied to get descriptive statistics. First of all, Exploratory Factor Analysis (EFA) was utilized to validate teacher-educator teaching styles. Utilizing inferential statistics, the student-teachers' perceptions of teacher-educator teaching styles and their SC were evaluated. Utilizing inferential statistics, the student-teachers' perceptions of teacher-educator teaching style and their SC were evaluated. In addition, a t-test and ANOVA were used to compare the SC of student-teacher across demographic variables like gender, age, year of study, academic program, and origin. Furthermore, structural equation modelling (SEM) was used to examine how different teaching styles affect the SC of preservice teachers. SPSS 24 and SmartPLS 3.3 were utilized for data analysis.

3.10.2 Qualitative analysis

Thematic analysis was done to evaluate qualitative data. Once the interviews were completed, all the interviews were transcribed, and themes were identified. Once all the interviews were transcribed, preliminary codes were carefully assigned to all sentences and paragraphs. Once all the interviews were coded, all the codes were divided into sub-themes. Software NVivo was also utilized for thematic analysis.

3.11 Ethical considerations

Ethical concerns are crucial aspects of every research. Therefore, the nature of challenges in social research differs significantly from that of natural science. In 2007, Cohen et al. stated that ethical concerns must be explained and treated at the beginning of an investigation. The researcher obtained official approval from her institution to gather information from other organizations. The goal of the study was clearly indicated in the letter, as was a commitment to maintain anonymity. Respondents were informed of the study's objectives and were guaranteed that their identities would not show in the final report. It was suggested that respondents not put their names on the surveys. The interviews were entirely voluntary. The consent form was created to acquire participants' agreement to participation in the research. The respondents were notified about their research rights and the confidentiality of their data. To avoid any uncertainties on the part of responders, the consent form includes the researcher's complete identification and contact information. Moreover, Olsson et al. (2016) granted the researcher permission to use the instrument built by him and his associates. Whereas TSI was used with proper citation and permission of Grasha.

Table 3.14

Summary of the Statistical Analysis

Research Objectives	Research hypotheses / questions	Statistical Technique
Objective 1 To investigate the perception of student-teachers about their teacher-educators' teaching styles.	**Q1**: What are the teaching styles adopted by the instructors while educating student-teachers for SD?	Descriptive: Mean, SDs, Thematic analysis
Objective 2 To explore the student-teachers' Sustainability consciousness.	**Q2:** What is the student' teachers' knowledge, attitude, and behavior towards SD.	Descriptive: Mean, SDs, Thematic analysis
Objective 3 To examine the perception of Student-teachers about their teacher-educator teaching styles based on gender and age	H_01-H_02	Independent Sample T-test and ANOVA
Objective 4 To investigate the difference between the SC of students based on gender, age, academic program, year of study, and educational institution.	H_03-H_07	Independent Sample T-test and ANOVA
Objective 5 To investigate the relationship between teacher-educators' teaching style and student-teachers' SC.	**Q3:** What is the role of teaching style in developing students' SC while educating them for SD? **H_08**	Structural equation modeling and Thematic analysis

CHAPTER 4

DATA ANALYSIS

4.1   Introduction

This chapter presents the analysis of the data collected and its interpretation. There are three sections of chapter four.   First of all, in the section one the demographical details of all the dimensions of teaching style and SC are provided. Section II provides information on the Descriptive statistics, mean and standard deviation of all constructs. The section III is about inferential statistics; results of the independent sample t-test. the results of ANOVA test based on educational institutions, educational program, and year of study respectively. Furthermore, in this section, the factor analysis results of both the scales and the results of the structural model of SEM have been provided. Section IV is about the thematic analysis of interviews.

4.2   Respondents' Demographic information

The survey was conducted from 15th of December 2021 till April 2022. The researcher targeted half of the population available, however, due to unavailability of few student-teachers, only 905 questionnaires were distributed among the student-teachers enrolled in teacher-education programs in seven public sector institutions in Rawalpindi and Islamabad Region. Questionnaires with incomplete data were not included in the analysis.

Out of 905, 832 questionnaires were filled out and returned. Out of the 832 responses, 54 questionnaires were either not filled out in full and 25 were deemed to be outliers and so disregarded. Scatter plots were used to identify these outliers. Thus, a total of 753 replies were received and analyzed, yielding a net response rate of 75.83%.

Table 4.1

Student-Teachers Demographical Details: Gender, Age, University, program, and Year of study

Variable	Categories	Frequency	Percent
Gender	Male	185	24.6
	Female	568	75.4
Age	19-21 Years	187	24.8
	22-24 Years	193	25.6
	25-27 Years	284	37.7
	28 & above	89	11.8
University	Institution 1	170	22.6
	Institution 2	60	8.0
	Institution 3	79	10.5
	Institution 4	53	7.0
	Institution 5	84	11.2
	Institution 6	185	24.6
	Institution 7	122	16.2
Program	BS Education	355	47.1
	B.Ed Secondary	122	16.2
	B.Ed Elementary	276	36.7
Year of Study	1st	227	30.1
	2nd	183	24.3
	3rd	204	27.1
	4th	139	18.5

Sample's characteristics are summarized in the table 4.1. The survey respondents comprise 568 (75.4%) female and 185 (24.6%) males (see table 4.1). The low ratio of male to female has been reported in the previous research in teacher-education domain in Pakistan (Kalsoom & Khanam, 2017). The breakdown of age groups of the respondents is provided in table 4.1. The results state that 187 (24.8%) respondents are aged between 19 – 21 years, 193 (25.6%) are between 22- 24 years age bracket, 284 (37.7%) are between 25-27 years old, 89 (11.8%) were 28 years and above.

The respondents' age distributions indicate that they come from a very youthful population since they were enrolled in undergraduate teacher-education programs.

Another demographic information collected from Student-teachers was about the university in which they were currently studying. Table 4.1 shows that 170 (22.6%) participants of the study are currently enrolled in teacher-education program at Institution 1, and 60 (8%) were studying at Institution 2. Moreover, among the collected responses, 79 (10.5%) were studying at Institution 3, 53 (7%) in Institution 4, 84 (11.2%) in institution 5, 185 (24.6%) in Institution 6, and 122 (16.2%) in Institution 7. Similarly, student-teachers were categorized based on the teacher-education program they were enrolled in. Table 4.1 shows that 355 (47.1%) respondents are enrolled in BS Education program, while 122 (16.2%) were enrolled in B.Ed. Secondary programs. Similarly, 276 (36.7%) were enrolled in B.Ed. Elementary program. Moreover, table 4.1also shows that 227 (30.1%) respondents were studying in the 1st year of their teacher education program followed by 183 (24.3%) in 2nd year, 204 (27.1%) in 3rd year, and 139 (18.5%) in 2nd year respectively. The details are provided in the table 4.1.

4.3 Descriptive analysis of teaching styles and Sustainability Consciousness

This section examines the findings for the five dimensions of teaching styles, including expert, formal authority, personal model, facilitator, and delegator teaching styles, as well as the three dimensions and nine sub dimensions of SC i.e., environmental consciousness (environmental knowingness, environmental attitude, and environmental behavior); social consciousness (social knowingness, social attitude, and social behavior); economic consciousness (economic knowingness, economic

attitude, and economic behavior). A mean score above 3.5 was considered as student-teacher agreement to the statement, between 3 and 3.5 was consider as neutral, and any score below 3 representing student-teacher disagreement.

Objective 1: To investigate the perception of student-teachers about their teacher-educators' teaching styles.

4.3.1 **Expert Teaching Style**

Table 4.2

Descriptive Statistics: Expert Teaching Style Items

Code	Items	M	SD	Remarks
Exp_1	Facts, concepts, and principles is the emphasis.	4.2	0.88	Agree
Exp_2	Sharing knowledge and expertise is important	4.2	0.95	Agree
Exp_3	What teacher has to say about a topic is important	4.2	0.94	Agree
Exp_4	The teacher wants students to leave this course well prepared	4.0	0.99	Agree
Exp_5	Lecturing is a significant part of the class sessions.	4.2	0.88	Agree
Exp_6	The instructor utilizes his/her expertise to resolve content-related disagreement.	4.2	0.93	Agree
Exp_7	The teacher can be described as a "storehouse of knowledge"	4.1	0.93	Agree
Exp_8	The time allotted for this course wasn't enough.	4.2	0.94	Agree
	Total	**4.2**		Agree

Table 4.2 provide the descriptive statistics for the items of expert teaching style. The student-teacher agreed to all the statements of expert teaching styles. The student-teachers agree to the statement regarding the importance of facts, concepts, and principle in teacher-educator teaching, and sharing knowledge and expertise. The student-teachers agreed with the statement that teacher point of view on any topic has the maximum weightage, and they want student-teachers to leave the course well prepared. Further, lecturing is a significant part of pedagogical approaches and

instructor utilizes their expertise to resolve content relate issues. The student-teachers consider their teachers as a "storehouse of knowledge", and they were off the view that the time allocated for the course was not enough to cover the course content. An overall mean score of 4.2 suggest that student-teacher perceived their teacher-educators possess expert teaching style.

4.3.2 **Formal Authority Teaching Style**

Table 4.3

Descriptive Statistics: Formal Authority Teaching Style Items

Code	Items	M	SD	Remarks
FA_1	The teacher sets high standards	3.5	1.20	Agree
FA_2	The teacher gives students negative feedback wherever needed	3.5	1.23	Agree
FA_3	Standards and expectations are strict and rigid.	3.4	1.16	Neutral
FA_4	Defines what and how student learn.	3.4	1.16	Neutral
FA_5	The teacher provides very clear guidelines.	3.5	1.25	Agree
FA_6	The teacher sets very specific goals and objectives.	3.6	1.27	Agree
FA_7	The teacher clearly states his/her expectations	3.5	1.25	Agree
FA_8	The teacher standards and expectations help students develop the discipline we need to learn.	3.5	1.29	Agree
	Total	**3.5**		**Agree**

Table 4.3 provide the descriptive statistics for formal authority teaching style. The student-teachers agree to the statement that teacher sets high standard and provide students negatively feedback wherever necessary. The student-teachers were neutral regarding the teacher-educator strict standards and expectations, and what and how to learn. Further, student-teachers agreed to the fact that their teacher-educator provide clear guidelines, set specific goals, objective, and expectations, and help students to develop discipline for learning. An overall mean score of 3.5 suggest that student-teacher perceived their teacher-educators possess formal authority teaching style.

4.3.3 **Personal Model Teaching Style**

Table 4.4

Descriptive Statistics: Personal Model Teaching Style Items

Code	Items	M	SD	Remarks
PM_1	Model appropriate ways.	3.5	1.33	Agee
PM_2	Encourages students to emulate examples.	3.4	1.50	Neutral
PM_3	Master the course content.	3.4	1.52	Neutral
PM_4	Provides personal experiences	3.4	1.50	Neutral
PM_5	Illustrating how to use of various principles and concepts.	3.3	1.33	Neutral
PM_6	Frequent verbal and/or written comments on performance.	3.3	1.46	Neutral
PM_7	Similar thinking.	3.5	1.58	Agree
PM_8	"Coach" who works closely with students	3.4	1.52	Neutral
	Total	**3.4**		**Neutral**

Table 4.4 provide the descriptive statistics for personal model teaching style. The student-teachers agree to the statement that teacher-educator models' appropriate ways in order to teach issues related to the content and resultantly student-teachers starts to think like their teacher. However, the student-teachers provided a neutral response regarding mastery of the content, teacher provides examples from personal experience, illustration of using various principles and concepts, frequent verbal and written comments on students' performance, and teacher as a coach. Overall mean score of 3.4 suggest that student-teacher are neutral about their teacher-educator personal model teaching style.

4.3.4 **Facilitator Teaching Style**

Table 4.5

Descriptive Statistics - Facilitator Teaching Style items

Code	Items	M	Std Dev	Remarks
Fac_1	Addressing diverse student learning styles.	3.3	0.99	Neutral
Fac_2	Consulting with students on improving individual projects.	3.5	1.28	Agree
Fac_3	Employing group discussions	3.4	1.24	Neutral
Fac_4	Guiding students on projects.	3.6	1.26	Agree
Fac_5	Encouraging students to take initiative	3.4	1.22	Neutral
Fac_6	Soliciting student advice how to teach this course.	3.5	1.31	Agree
Fac_7	Allows students to make choices among activities.	3.5	1.24	Agree
Fac_8	Gives personal support and encouragement to do well.	3.5	1.17	Agree
	Total	**3.5**		**Agree**

Table 4.5 provide the descriptive statistics for facilitator teaching style. The student-teacher agreed to the statement that teacher-educators consults on their projects, guides them, allow students to make changes in the activities during the course, and encourage/supporting student-teachers to do well. However, student-teachers remained neutral regarding the question related to whether teacher-educator addresses various learning styles, employ group discussions, and soliciting student-teachers suggestion/advice how to teach course. An overall mean score was 3.5, which suggest that student-teacher were neutral about their teacher-educator facilitator teaching style.

4.3.5 **Delegator Teaching Style**

Table 4.6

Descriptive Statistics: Delegator Teaching Style Items

Code	Items	M	SD	Remarks
Del_1	Students work on projects with little supervision.	2.6	1.20	Disagree
Del_2	Activities to encourage students to develop ideas about content issues.	2.5	1.18	Disagree
Del_3	Allows students to design self-directed learning experiences.	2.6	1.22	Disagree
Del_4	Developing student ability to works independently	2.6	1.17	Disagree
Del_5	Encouraging students for teaching a class session.	2.5	1.20	Disagree
Del_6	Allowing students to set their own pace for project completion.	2.6	1.26	Disagree
Del_7	Delegating tasks and responsibilities to students.	2.5	1.17	Disagree
Del_8	Developing students' discipline to learn.	2.4	1.18	Disagree
	Total	**2.5**		**Disagree**

Table 4.6 provide the descriptive statistics for delegator teaching style. The student-teacher disagreed to all the statements of delegator teaching styles. The student-teachers disagreed to the statement regarding the works with little supervision, incorporating activities for student-teacher to develop idea related to content issues, self-develop learning, work independently, teaching a class, allowing students to work on their own pace, delegating task and responsibilities, and developing student discipline to learn. An overall mean score of 2.53 suggest that student-teacher disagree with the idea that their teacher-educator utilized delegator teaching style.

4.3.6 **Overall Mean of teaching styles (N=753)**

Table 4.7

Overall Mean of Teaching Style

Code	Dimensions	M	Remarks
Exp	Expert	4.2	Agree
FA	Formal authority	3.5	Agree
PM	Personal model	3.4	Neutral
Fac	Facilitator	3.5	Agree
Del	Delegator	2.5	Disagree
	Total	**3.4**	Neutral

Objective 2: to explore the student-teachers' sustainability consciousness.

4.3.7 **Environmental knowingness pertinent to Sustainable development**

Table 4.8

Descriptive Statistics: Environmental Knowingness Items

Code	Items	M	SD	Remarks
EnK1	Reducing water consumption	3.5	1.18	Agree
EnK2	Preserving nature.	3.4	1.26	Neutral
EnK3	Reducing all sorts of waste	3.5	1.24	Agree
EnK4	Preserving the variety of living creatures	3.5	1.23	Agree
EnK5	Shift to renewable natural resources	3.6	1.22	Agree
EnK6	Role of Education to protect against natural disasters.	3.4	1.14	Neutral
	Total	**3.5**		**Agree**

Table 4.8 provide the descriptive statistics for environmental knowingness scale. Overall mean score of 3.4 suggest that most of the student-teachers have average and are neutral about their environmental knowingness.

4.3.8 **Social Knowingness pertinent to Sustainable development**

Table 4.9

Descriptive Statistics: Social Knowingness Items

Code	Items	M	SD	Remarks
SK1	Long and healthy life	4.0	1.10	Agree
SK2	A culture where conflicts are resolved peacefully	3.9	1.09	Agree
SK3	Exercise democratic rights	3.9	1.05	Agree
SK4	Equality around the world	3.9	1.11	Agree
SK5	Respecting human rights	3.9	1.06	Agree
SK6	Access to good education.	3.9	1.07	Agree
SK7	Respect for other cultures	3.9	1.05	Agree
SK8	Infectious diseases must be stopped	4.0	1.11	Agree
	Total	**3.9**		**Agree**

Table 4.9 provide the descriptive statistics for social knowingness scale. Overall mean score of 3.93 suggest that most of the student-teachers have average and are neutral about their social knowingness.

4.3.9 **Economic Knowingness Pertinent to Sustainable Development**

Table 4.10

Descriptive Statistics: Economic Knowingness Items

Code	Items	M	SD	Remarks
EcK1	Companies should act responsibly	2.9	1.33	Disagree
EcK2	Fair distribution of goods and services	3.2	1.42	Neutral
EcK3	Wiping out poverty	3.5	1.22	Agree
EcK4	Understanding how economy functions	2.5	1.20	Disagree
	Total	**3.0**		**Neutral**

Table 4.10 provide the descriptive statistics for economic knowingness scale. Overall mean score of 3.02 suggest that most of the student-teachers have below average economic knowingness.

4.3.10 **Environmental Attitude Towards Sustainable Development**

Table 4.11

Descriptive Statistics: Environmental Attitude Items

Code	Item	M	SD	Remarks
EnAt1	Using more natural resources than needed threaten future.	3.6	1.23	Agree
EnAt 2	Stricter laws and regulations to protect environment.	3.7	1.28	Agree
EnAt 3	Measures against problems of climate change.	3.7	1.16	Agree
EnAt 4	Use of water carefully	3.6	1.20	Agree
	Total	**3.7**		**Agree**

Table 4.11 provide the descriptive statistics for environmental attitude scale. Overall mean score of 3.66 suggest that most of the student-teachers have above average environmental attitude.

4.3.11 **Social Attitude towards Sustainable development**

Table 4.12

Descriptive Statistics: Social Attitude Items

Code	Items	M	SD	Remarks
SoAt1	opportunity to acquire knowledge, values, and skills	3.6	0.94	Agree
SoAt2	Quality of life for future generations.	3.6	0.96	Agree
SoAt3	Financial assistance to go green.	3.7	0.85	Agree
SoAt4	Government decisions	3.6	0.99	Agree
SoAt5	People should exercise their democratic rights	3.6	0.97	Agree
SoAt6	Equal opportunities for men and women	3.6	0.94	Agree
	Total	**3.6**		

Table 4.12 provide the descriptive statistics for social attitude scale. Overall mean score of 3.61 suggest that most of the student-teachers have above average social attitude.

4.3.12 Economic Attitude towards Sustainable development

Table 4.13

Descriptive Statistics: Economic Attitude Items

Code	Items	M	SD	Remarks
EcAt1	Companies must reduce the use of packaging and disposable articles.	3.6	1.19	Agree
EcAt2	Poverty reduction	3.6	1.24	Agree
EcAt3	Same working conditions for all	3.7	1.21	Agree
EcAt4	People harms environment should pay for the damage	3.7	1.16	Agree
	Total	**3.7**		**Agree**

Table 4.13 provide the descriptive statistics for economic attitude scale. Overall mean score of 3.64 suggest that most of the student-teachers have above average economic attitude.

4.3.13 Environmental Behavior towards Sustainable development

Table 4.14

Descriptive Statistics: Environmental Behavior Items

Code	Item	M	SD	Remarks
EnB1	Choosing cycle or walk over motor vehicle	2.8	1.31	Disagree
EnB2	Never waste water	2.7	1.25	Disagree
EnB3	Recycling	2.7	1.27	Disagree
EnB4	Pick up rubbish	2.8	1.24	Disagree
EnB5	Separate food waste before putting out the rubbish	2.6	1.15	Disagree
EnB6	reduce waste	2.7	1.29	Disagree
EnB7	Change in personal lifestyle	2.7	1.35	Disagree
	Total	**2.7**		**Disagree**

The Table 4.14 provide the descriptive statistics for environmental behaviors scale. Overall mean score of 2.7 suggest that most of the student-teachers have below average environmental behaviors.

4.3.14 **Social behaviors towards Sustainable development**

Table 4.15

Descriptive Statistics: Social Behavior Items

Code	Items	M	SD	Remarks
SoB1	Treat others respectfully	3.1	1.27	Neutral
SoB2	Avoid making lifestyle choices not good for my health.	3.2	1.37	Neutral
SoB3	Work on committees/societies at my university.	3.2	1.29	Neutral
SoB4	Respecting others culture	3.1	1.29	Neutral
SoB5	Supporting aid organization or environmental group	3.0	1.09	Neutral
SoB6	Respecting all irrespective of genders/age	3.1	1.24	Neutral
	Total	**3.1**		**Neutral**

Table 4.15 provide the descriptive statistics for social behaviors scale. Overall mean score of 3.11 suggest that most of the student-teachers have average social behaviors.

4.3.15 **Economic Behavior towards Sustainable development**

Table 4.16

Descriptive Statistics: Economic Behavior Items

Code	Items	M	SD	Remarks
EcB1	Help poor people	3.0	1.44	Neutral
EcB2	Purchase second-hand goods	3.0	1.19	Neutral
EcB3	Avoid buying goods from bad reputed companies	3.0	1.39	Neutral
EcB4	Watch news or read articles related to economy.	3.0	1.30	Neutral
	Total	**3.0**		**Neutral**

Table 4.16 provide the descriptive statistics for economic behavior scale. Overall mean score of 3.01 suggest that most of the student-teachers have average economic behaviors.

4.3.16 Overall mean of Sustainability Consciousness

Table 4.17

Overall mean of SC

Code	Dimensions	M	Remarks
EnK	Environmental knowledge	3.5	Agree
SK	Societal knowledge	3.9	Agree
EcK	Economic knowledge	3.0	Neutral
	Overall sustainability knowledge	**3.5**	**Agree**
EnAt	Environmental attitude	3.7	Agree
SoAt	Societal attitude	3.6	Agree
EcAt	Economic attitude	3.6	Agree
	Overall sustainability attitude	**3.6**	**Agree**
EnB	Environmental behavior	2.7	Disagree
SoB	Societal behavior	3.1	Neutral
EcB	Economic behavior	3.0	Neutral
	Overall sustainability behavior	**2.9**	Disagree
	Total	**3.4**	**Neutral**

4.4   Inferential Statistics

Objective 3: *To explore the differences in perception of student-teachers about their teacher-educator teaching styles based on gender and age.*

4.4.1   Analysis of student-teachers' perception of teaching styles based on gender.

Objective 3a. *To explore gender-based differences in student-teachers' perceptions about teacher- educators' teaching styles.*

H₀1: *Student-teachers of both gender groups have no difference in perception about their teacher-educators' teaching styles.*

The results of the comparative analysis of student-teachers perception of their teacher-educator teaching style based on their gender is provided in Table 4.17.

Table 4.18

Students-Teachers' Perception of Teaching Style Based on Their Gender (H01a To H01e)

Variable	Group							95% CI		Cohen d
	Female (N = 568)		Male (N = 185)							
	M	SD	M	SD	t	df	p	LL	UL	
Expert	4.16	0.79	4.21	0.70	0.724	751	0.47	(0.08)	0.18	0.07
Formal Authority	3.51	1.01	3.46	1.00	0.579	751	0.56	(0.22)	0.12	0.05
Personal Model	3.41	1.32	3.42	1.35	0.14	751	0.89	(0.21)	0.24	0.01
Facilitator	3.46	1.01	3.51	0.99	0.60	751	0.56	(0.12)	0.22	0.05
Delegator	2.51	0.93	2.58	0.95	0.81	751	0.42	(0.09)	0.22	0.07

The information on the male and female mean perceived teaching styles score can be found in Table 4.18. Levene's test found an unequal variance in the male and females' student-teachers perception regarding their teacher-educator teaching style i.e., $p \geq 0.05$. Moreover, based on the results of t-test, there does not seem to be gender-based difference in the student-teachers' perception pertinent to their teacher-educator teaching style i.e., $p \geq 0.05$. Hence, H01 was supported by the results.

4.4.2 **Analysis of student-teachers' perception of teaching styles based on age.**

Objective 3b. *To investigate age-wise differences in student-teachers' perceptions about teacher- educators' teaching styles.*

H$_0$2: *Student-teachers' of all age groups have no difference in perception about their teacher-educator teaching style.*

4.4.2.1 Expert Teaching Style

Table 4.19

Students-Teachers' Perception of Expert Teaching Style Based on Their Age (H02a)

Age	N	M	Std Dev	F	p
19-21 Years	187	4.17	0.77		
22-24 Years	193	4.05	0.88		
25-27 Years	284	4.24	0.67	2.404	0.07
28 & above	89	4.22	0.82		
Total	**753**	**4.17**	**0.78**		

Table 4.19 depicts the mean and standard deviation of the teacher-educator expert teaching style based on student-teachers age. According to the findings of Levene's test, the data seem to violate equality of variance assumption. ($p < 0.05$). Welch ANOVA was used to assess whether there are age-based differences in how student-teachers perceive their teacher-educator expert teaching style. The Welch ANOVA findings suggest no age-based difference in student-teachers' perception of their teacher-educator expert teaching style ($p = 0.07 > 0.05$).

4.4.2.1 Formal Authority Teaching Style

Table 4.20

Students-Teachers' Perception of Formal Authority Teaching Style Based on Their Age (H02b)

Age	N	M	Std Dev	F	P
19-21 Years	187	3.38	1.04		
22-24 Years	193	3.30	1.02		
25-27 Years	284	3.63	0.94	7.11	0.000
28 & above	89	3.75	0.95		
Total	**753**	**3.50**	**1.00**		

Table 4.20 depicts the mean and standard deviation of the teacher-educator formal authority teaching style based on student-teachers age. The Levene's test results suggested that the data violate the equality of variance assumption ($p < 0.05$).

Table 4.21

Post Hoc Results for Formal Authority Teaching Style Based on Age

	Age(I)	Age(J)	Mean Diff(I-J)	SE	Sig.	95% CI LB	UB
	19-21	22-24	0.82	0.11	0.87	-0.19	0.36
Games-Howell	25-27	19-21	0.25*	0.09	0.04	0.002	0.49
		22-24	0.33*	0.09	0.002	0.09	0.57
	28 & above	19-21	0.37*	0.13	0.02	0.05	0.70
		22-24	0.46*	0.13	0.002	0.13	0.78
		25-27	0.13	0.12	0.68	-0.17	0.43

LB = *Lower Bound*; UB = *Upper Bound*

* *Significance level = 0.05*.

Welch ANOVA was conducted to assess student-teachers' perception pertinent to their teacher-educator formal authority teaching styles based on their age. Student-teachers perceived teaching styles were statistically significantly different between student-teachers of various age groups, Welch's $F (3, 309.2) = 7.11$, $p < 0.0005$. The results suggest that student-teachers of various age groups perceived their teacher-educators teaching style differently i.e., the student-teachers in the higher age groups consider their teacher more formal authority oriented compared to younger student-teachers i.e., 19-21 year (3.38 ± 1.04), 22-24 Years (3.30 ± 1.02), 25-27 Years (3.63 ± 0.94), to 28 & above (3.75 ± 0.95). Games-Howell post hoc results found no statistically significant difference in 19-21 years and 22-24 age group was found i.e., $p > 0.05$. Similarly, results of Games-Howell post hoc test suggest that the student-teachers belonging to age group 25-27 years and 28 & above have significantly different and

higher mean formal authority scores compared to the student-teacher of 19 – 21 years and 22 – 24 years age group.

4.4.2.2 Personal Model Teaching Style

Table 4.22

Students-teachers' Perception of Personal Model Teaching Style based on Their Age (H02c)

Age	N	M	Std Dev	F	P
19-21 Years	187	3.38	1.35		
22-24 Years	193	3.26	1.30		
25-27 Years	284	3.58	1.30	2.733	0.043
28 & above	89	3.27	1.38		
Total	**753**	**3.41**	**1.33**		

Table 4.22 depicts the mean and standard deviation of the teacher-educator formal authority teaching style based on student-teachers age. The Levene's test results suggested that the data meet the equality of variance assumption i.e., p-value is greater than .05.

Table 4.23

Post Hoc Results for Personal Model Teaching Style Based on Age

	Age(I)	Age(J)	Mean Diff(I-J)	SE	Sig.	95% CI	
						LB	UB
Tukey HSD	19-21	22-24	0.12	0.14	0.81	-0.22	0.47
	25-27	19-21	0.20	0.12	0.39	-0.12	0.52
		22-24	0.32*	0.12	0.05	0.00	0.63
	28 & above	19-21	-0.12	0.17	0.90	-0.55	0.32
		22-24	0.004	0.17	0.89	-0.52	0.44
		25-27	-0.31	0.16	0.21	-0.34	0.10

LB = *Lower Bound*; UB = *Upper Bound*

* *Significance level = 0.05*.

Tukey ANOVA was conducted to assess student-teachers' perception pertinent to their teacher-educator personal model teaching styles based on their age. Student-teachers perceived teaching styles were statistically significantly different between student-teachers of various age groups, i.e., F (3, 749) = 2.73, p < 0.043. The results suggest that student-teachers of various age groups perceived their teacher-educators personal model teaching style differently. However, the only significant difference was found between the age group 25-27 year with the 22-24 age group. Rest of the groups have insignificant difference pertinent to their perception of their teacher-educator personal model teaching style.

4.4.2.3 Facilitator Teaching Style

Table 4.24

Students-Teachers' Perception of Facilitator Teaching Style Based on Their Age (H02d)

Age	N	M	Std Dev	F	p
19-21 Years	187	3.36	1.00		
22-24 Years	193	3.25	1.05		
25-27 Years	284	3.59	0.96	9.264	0.000
28 & above	89	3.80	0.85		
Total	753	3.47	1.00		

Table 4.24 depicts the mean and standard deviation of the teacher-educator facilitator teaching style based on student-teachers age. The Levene's test results suggested that the data violate the equality of variance assumption (p < 0.05).

Table 4.25

Post Hoc Results for Facilitator Teaching Style Based on Age

	Age(I)	Age(J)	Mean Diff(I-J)	SE	Sig.	95% CI LB	95% CI UB
	19-21	22-24	0.11	0.11	0.71	0.16	0.39
Games-Howell	25-27	19-21	0.23	0.09	0.07	0.01	0.47
		22-24	0.34*	0.09	0.002	0.10	0.59
	28 & above	19-21	0.44*	0.12	0.001	0.13	0.3274
		22-24	0.55*	0.12	0.000	0.24	0.86
		25-27	0.21	0.11	0.204	0.07	0.49

LB = *Lower Bound*; UB = *Upper Bound*

* *Significance level = 0.05.*

Welch ANOVA was conducted to assess student-teachers' perception pertinent to their teacher-educator facilitator teaching styles based on their age. Student-teachers perceived teaching styles were statistically significantly different between student-teachers of various age groups, i.e., $F (3, 317.6) = 9.264$, $p < 0.000$. The results suggest that student-teachers of various age groups perceived their teacher-educators facilitator teaching style differently. Games-Howell post hoc results suggest that the student-teachers belonging to age group 28 & above have significantly positive and higher mean difference compared to the student-teacher of 19 – 21 years and 22 – 24 years age group. Similarly, student-teachers belonging to age group 25-27 years perceived their teacher-educator as more facilitator compared to student-teacher of 22 – 24 years age group.

4.4.2.4 Delegator Teaching Style

Table 4.26

Students-Teachers' Perception of Delegator Teaching Style Based on Their Age (H02e)

Age	N	M	Std Dev	F	p
19-21 Years	187	2.44	0.89		
22-24 Years	193	2.27	0.79		
25-27 Years	284	2.65	0.96	11.29	0.000
28 & above	89	2.89	1.10		
Total	753	2.53	0.94		

Table 4.26 depicts the mean and standard deviation of the teacher-educator facilitator teaching style based on student-teachers age. The Levene's test results suggested that the data violate the equality of variance assumption ($p < 0.05$).

Table 4.27

Post Hoc Results for Delegator Teaching Style Based on Age

	Age(I)	Age(J)	Mean Diff(I-J)	SE	Sig.	95% CI LB	UB
	19-21	22-24	0.17	0.09	0.21	0.05	0.39
Games-Howell	25-27	19-21	0.20	0.09	0.09	0.02	0.43
		22-24	0.37*	0.08	0.000	0.16	0.58
	28 & above	19-21	0.44*	0.13	0.006	0.10	0.79
		22-24	0.61*	0.12	0.000	0.28	0.95
		25-27	0.24	0.11	0.250	0.09	0.58

LB = *Lower Bound*; UB = *Upper Bound*

* *Significance level = 0.05*.

Welch ANOVA was conducted out to assess student-teachers' perception pertinent to their teacher-educator delegator teaching styles based on their age. Student-teachers perceived teaching styles were statistically significantly different between student-teachers of various age groups, i.e., $F (3, 302.8) = 11.29$, $p < 0.000$. The results

suggest that student-teachers of various age groups perceived their teacher-educators delegator teaching style differently. The results suggest that the student-teachers belonging to age group 28 & above have significantly positive and higher mean scores compared to the student-teacher of $19-21$ years and $22-24$ years age group. Similarly, student-teachers belonging to age group 25-27 years perceived their teacher-educator as more delegator compared to student-teacher of $22-24$ years age group.

Objective 4: To examine the differences in the sustainability consciousness of student-teachers based on demographical variables; gender, age, academic programs, enrollment years, and institution.

4.4.3 **Analysis of student-teachers' sustainability consciousness based on gender.**

Objective 4a. *to examine gender-based differences in student-teachers' sustainability consciousness.*

H$_0$3: *There is no gender-based differences in student-teachers' sustainability consciousness.*

The 4.28 provides information about the comparative analysis of male and female student-teachers sustainability consciousness.

Table 4.28

Sustainability Consciousness Comparison based on gender (H03a to H03i)

| Variable | Group | | | | | | | 95% CI | | Cohen's d |
| | Male (N = 185) | | Female (N = 568) | | | | | | | |
	M	SD	M	SD	t	df	p	LL	UL	
Environmental Knowingness	3.6	1.0	3.4	1.0	2.2	333.7	0.0	0.0	0.3	0.2
Social Knowingness	4.2	0.5	3.8	0.9	6.3	543.8	0.0	0.2	0.5	0.4
Economic Knowingness	3.1	1.2	3.0	1.2	1.1	751.0	0.3	0.1	0.3	0.1
Environmental Attitude	3.5	1.1	3.7	1.0	-2.5	292.5	0.0	0.4	0.0	0.2
Social Attitude	3.5	1.0	3.7	0.7	-1.9	246.8	0.1	0.3	0.0	0.2
Economic Attitude	3.5	1.1	3.7	1.0	-1.5	751.0	0.1	0.3	0.0	0.1
Environmental Behavior	3.0	1.1	2.6	1.0	4.3	283.5	0.0	0.2	0.2	0.4
Social Behavior	3.3	1.0	3.0	1.1	3.1	329.4	0.0	0.1	0.4	0.3
Economic Behavior	3.2	1.2	2.9	1.2	3.1	751.0	0.0	0.1	0.5	0.3

4.4.3.1 Environmental Knowingness

Table 4.28 provides data about the male and female student-teachers environmental knowledge pertinent to SD. The results indicate that student-teachers have above average environmental knowledge. The Levene's test results suggested that the data meet the equality of variance assumption ($p > 0.05$). Moreover, Findings suggest a significant difference in the environmental knowingness scores can be explained based on the student-teachers' gender i.e., 0.18 (95% CI, 0.018 to -0.345), t (333.725) = 2.189, p = 0.029, d = 0.18. Moreover, the mean scores reported by the male student-teachers (M = 3.58) is slightly higher than the mean score reported by their female counterparts (M = 3.40). The results indicate that student-teachers above average environmental knowingness in perspective of SD.

4.4.3.2 Social Knowingness

Table 4.28 provides data about the male and female student-teachers social knowledge pertinent to SD. The results also indicate that student-teachers have above average social knowledge. According to the Levene's test, the data failed the equality of variance assumption., i.e., $p > 0.05$. A significant difference in the social knowledge can be explained based on the gender i.e., 0.35 (95% CI, 0.24 to 0.46), t (543.86) = 6.294, p = 0.000, d = 0.42 (see table 4.28). Moreover, the mean scores reported by the male student-teacher (M = 4.19) is significantly higher than the mean score reported by their female counterparts (M = 3.84). The results indicate that student-teachers have fair knowledge of social issues.

4.4.3.3 Economic Knowingness

The information that is given in Table 4.28 provides a gender-based comparison of student-teachers' economic knowledge. The results shows that males have a mean score of 3.10 ± 1.20. In addition to this, the mean score for female student-teachers is 2.99 ± 1.17. The Levene's test results suggested that the data meet the equality of variance assumption ($p > 0.05$). Moreover, findings suggest that student-teachers exhibited similar economic knowingness scores and no difference can be explained in their economic knowingness based on the gender i.e., p = 0.28. The results also indicate that student-teachers have below average knowledge of pertinent to the economic perspective of SD.

4.4.3.4 Environmental Attitude

The information that is given in Table 4.28 makes a gender-based comparison between student-teachers on environmental attitude pertinent to SD. The results shows that males have a mean score of 3.48 ± 1.09 while the female student-teachers have a

mean score of 3.71 ± 1.01. The data conform to the equality of variance assumption (p < 0.05), as shown by Levene's test. The data in the Table 4.28 also exhibit that a statistically significant difference in student-teachers environmental attitude can be explained based on their gender i.e., -0.23 (95% CI, -0.41 to -0.048), t (292.592) = -2.50, p = 0.013, d = 0.22. Moreover, the mean scores reported by the male student-teacher (M = 3.48) is slightly lower than the mean score reported by their female counterparts (M = 3.71). The findings also suggest that student-teachers have an environmental attitude that is favorable and more positive than normal in the context of SD.

4.4.3.5 Social Attitude

The results given in Table 4.28 provides a gender-based comparison of student-teachers' social attitude pertinent to SD. The results show that males have a mean score of 3.50 ± 1.0. In addition to this, female student-teachers social attitude score is 3.65 ± 0.71. The Levene's test results suggested that the data did not comply with the equality of variance assumption i.e., p < 0.05. Findings shows that that student-teachers exhibited a similar social attitude and difference can't be explained based on their gender (p > 0.05) (see Table 4.28). Moreover, a positive and above-average social attitudes toward SD were found among both male and female student-teachers.

4.4.3.6 Economic Attitude

The results given in Table 4.28 provides a gender-based comparison for student-teachers economic attitude pertinent to SD. The results show mean score of 3.54 ± 1.09 and 3.67 ± 1.02 for male and female student-teachers respectively. The Levene's test shows that equality of variance assumption was met. The findings in Table 4.28 shows that no gender-based difference was found in student-teachers' economic attitude (p >

0.05). Moreover, a positive and above-average economic attitude toward SD was found among both male and female student-teachers.

4.4.3.7 Environmental Behavior

Table 4.28 provides gender-based comparison on environmental behavior towards SD. The male student-teachers environmental behavior score is 3.01 ± 1.08. Contrarily, the female student-teachers' environmental behavior score is 2.63 ± 0.96. The Levene's test results suggested that the data did not comply with the equality of variance assumption. Table 4.28 demonstrates that gender-based exists in the environmental behavior of student-teachers i.e., 0.39 (95% CI: .21 to .56), t (83.5) = 4.27, p = .000, d = .40. In addition, the mean scores recorded by male student-teachers are marginally higher than those reported by their female counterparts (M = 3.02 vs. M = 2.62). Moreover, below-average environmental behavior toward SD was found among both male and female student-teachers.

4.4.3.8 Social Behavior

The results of a comparison between student-teachers in terms of their mean scores for social behavior are shown in Table 4.28. According to the collected information, the mean score for male student-teachers is 3.31, and the standard deviation is 1.01. The average score for female student-teachers is 3.04, with a standard deviation of 1.07. The equality of variance assumption was not met by the data (p < 0.05), as shown by the result of Levene's test. Table 4.28 reveals that a statistically significant difference can be explained in the social behavior based on the gender of the student-teachers. This difference is 0.26 (95% CI: 0.06 to 0.40), t (329.4) = 2.704, p = 0.002, d = 0.22. Furthermore, the mean scores that were recorded by male student-teachers are better than their female counterparts (M = 3.31 vs. M = 3.04). Moreover, a

below-average social behavior toward SD was found among both male and female student-teachers.

4.4.3.9 Economic Behavior

The findings of a comparison of economic behavior based on student-teachers' gender is shown in Table 4.28. According to the data gathered, male student-teachers mean score is 3.24 ± 1.16 while female student-teachers mean score is 2.93 ± 1.17. The Levene's test results suggested that the data meet the equality of variance assumption ($p > 0.05$). Table 4.28 reveals that a statistically significant difference can be explained in the economic behavior based on the gender of the student-teachers. This difference is 0.30 (95% CI: 0.11 to 0.50), $t\,(751) = 3.059$, $p = 0.002$, $d = 0.22$. Furthermore, the mean scores that were recorded by male student-teachers are better than their female counterparts (M = 3.23 vs. M = 2.93). Moreover, a below-average social behavior toward SD was found among both male and female student-teachers.

4.4.4   **Analysis of student-teachers' sustainability consciousness based on age.**

Objective 4b. *to find age-based differences in student-teachers' sustainability consciousness.*
H$_0$4*: Student-teachers of all age groups have no difference in their sustainability consciousness.*

4.4.4.1 Environmental Knowingness

Table 4.29

Students-Teachers' Environmental Knowingness Based on Their Age (H04a)

Age	N	M	Std Dev	F	p
19-21 Years	187	3.36	1.04		
22-24 Years	193	3.14	1.13		
25-27 Years	284	3.63	0.83	11.11	0.0005
28 & above	89	3.73	1.07		
Total	**753**	**3.45**	**1.02**		

Table 4.28 depicts the results of student-teachers' environmental knowingness based on their age. The Levene's test results suggested that the data violate the equality of variance assumption ($p < 0.05$).

Table 4.30

Post Hoc Results for Environmental Knowingness Scores Based on Age

	Age(I)	Age(J)	Mean Diff(I-J)	SE	Sig.	95% CI LB	UB
Games-Howell	19-21	22-24	0.22	0.11	0.22	0.07	0.47
	25-27	19-21	0.26*	0.09	0.01	0.04	0.48
		22-24	0.49*	0.09	0.00	0.23	0.70
	28 & above	19-21	0.36*	0.14	0.01	0.08	0.79
		22-24	0.59*	0.14	0.00	0.28	1.00
		25-27	0.09	0.12	0.51	0.15	0.50

LB = *Lower Bound*; UB = *Upper Bound*

* *Significance level = 0.05*.

One-way Welch ANOVA test was utilized to assess student-teachers' environmental knowingness is different for student-teachers belonging to different age group. Student-teachers were divided into four groups: 19-21 Years (n = 187), 22-24 Years (n = 193), 25-27 Years (n = 284), and 28 & Above (n = 89) respectively. Levene's test suggests data violated the equality of variance assumption (p = .0005). Environmental attitude score was statistically significantly different between student-teachers of various age groups, Welch's F (3, 294.7) = 12.26, p = 0.0005. The results suggest that environmental knowingness score increased with the increase in age i.e., 19-21 year (3.36 ± 1.13), 22-24 years (3.13 ± 1.04), 25-27 years (3.63 ± 0.0.83), to 28 & above (3.73 ± 1.08). In a post hoc Games-Howell analysis, the results suggest that 28 & above year age category student-teachers' have the highest environmental knowingness. Moreover, a significant difference in various age group was found.

4.4.4.2 Social Knowingness

Table 4.31

Students-Teachers' Social Knowingness Based on Their Age (H04b)

Age	N	M	Std Dev	F	P
19-21 Years	187	3.82	0.94		
22-24 Years	193	3.80	0.89		
25-27 Years	284	4.03	0.79	4.735	0.003
28 & above	89	4.06	0.69		
Total	753	3.93	0.85		

Table 4.30 depicts the results for student-teachers' social knowingness based on their age. The Levene's test results suggested that the data violate the equality of variance assumption (p < 0.05).

Table 4.32

Post Hoc Results for Social Knowingness Scores Based on Age.

	Age(I)	Age(J)	Mean Diff(I-J)	SE	Sig.	95% CI LB	UB
	19-21	22-24	0.02	0.09	1.00	-0.23	0.26
		19-21	0.21	0.08	0.05	0.00	0.43
	25-27	22-24	0.23*	0.08	0.02	0.02	0.44
Games-Howell		19-21	0.24	0.10	0.08	-0.02	0.50
	28 & above	22-24	0.26*	0.10	0.04	0.01	0.51
		25-27	0.03	0.09	0.99	-0.20	0.26

LB = *Lower Bound*; UB = *Upper Bound*

* *Significance level = 0.05*.

Welch ANOVA was conducted to assess student-teachers' social knowingness belonging to various age groups. Levene's test suggests data violated the equality of variance assumption (p = .0005). Social Knowingness score was statistically significantly different between student-teachers of various age groups, Welch's F (3, 319.26) = 4.735, p = 0.003. The results suggest that social knowingness score increased

with the increase in age i.e., 19-21 year (3.82 ± 0.98), 22-24 Years (3.80 ± 0.06), 25-27 Years (4.03 ± 0.79), to 28 & above (4.06 ± 0.86). Post hoc results show no significant difference in the 19-21 year and 22-24 age group was found i.e., p > 0.05. Similarly, results of Games-Howell post hoc test suggest that the student-teachers belonging to age group 25-27 have significantly different and higher mean social attitude scores compared to the student-teacher of 22-24 years age group [(.23, 95% CI (.025 to .43), p < .021]. Similarly, results of Games-Howell post hoc test suggest that the student-teachers belonging to age group 28 & above have significantly different and higher mean social knowingness scores compared to the student-teacher of 22-24 years age group [(.27, 95% CI (.01 to .51), p < .01].

4.4.4.3 Economic Knowingness

Table 4.33

Students-teachers' Economic Knowingness Based on Their Age (H04c)

Age	N	M	Std Dev	F	P
19-21 Years	187	3.03	1.19		
22-24 Years	193	3.06	1.20		
25-27 Years	284	2.98	1.16	0.227	0.878
28 & above	89	3.02	1.18		
Total	**753**	**3.02**	**1.18**		

Table 4.33 shows the average and standard deviation of student-teachers' economic knowledge based on their age. One-way ANOVA was conducted to find out differences in economic knowingness among student-teachers belongs to different age group. Levene's test suggests data fulfill the equality of variance assumption (p = 0.665). One-way ANOVA shows no statistically significant variation in student-teachers' economic knowingness over the various years i.e., p = 0.878 > 0.05.

4.4.4.4 Environmental Attitude

Table 4.34

Students-teachers' Environmental Attitude Based on Their Age (H04d)

Age	N	M	Std Dev	F	P
19-21 Years	187	3.65	1.03		
22-24 Years	193	3.61	1.06		
25-27 Years	284	3.58	1.01	3.598	0.013
28 & above	89	3.99	1.03		
Total	**753**	**3.65**	**1.04**		

Table 4.34 shows the average and standard deviation of student-teachers' environmental attitude by year. A Tukey one-way ANOVA was carried out to assess student-teachers' environmental attitude knowingness belonging to various age groups. Levene's test suggests data violated the equality of variance assumption (p > .05). The results suggest that environmental attitude score was statistically significantly different between student-teachers of various age groups, $F_{(3, 749)} = 3.598$, p = 0.013. Tukey post hoc analysis revealed that the student-teachers belonging to age group 28 & above have significantly different and higher mean environmental attitude scores compared to the student-teacher of 22-24 years age group [(.37, 95% CI (.03 to .71), p = .03] and 25-27 years age group [(.40, 95% CI (.08 to .73), p = .01].

Table 4.35

Post Hoc Results for Environmental Attitude Scores Based on Their Age

	Age(I)	Age(J)	Mean Diff(I-J)	SE	Sig.	95% CI	
						LB	UB
	19-21	22-24	0.03	0.11	0.99	-0.24	0.30
		19-21	-0.03	0.11	0.99	-0.30	0.24
	22-24	25-27	0.03	0.10	0.99	-0.22	0.28
Tukey HSD		19-21	0.34	0.13	0.05	0.00	0.68
	28 & above	22-24	0.37*	0.13	0.03	0.03	0.71
		25-27	0.40*	0.13	0.01	0.08	0.73

LB = Lower Bound; UB = Upper Bound
* Significance level = 0.05.

4.4.4.5 Social Attitude

Table 4.36

Students-Teachers' Social Attitude Based on Their Age (H05e)

Age	N	M	Std Dev	F	P
19-21 Years	187	3.47	0.86		
22-24 Years	193	3.60	0.78	8.233	0.0005
25-27 Years	284	3.63	0.80		
28 & above	89	3.89	0.56		
Total	753	3.61	0.79		

Table 4.36 displays the average and standard deviation of social attitudes among student-teachers by year. Welch ANOVA was used to investigate if the social attitudes of student-teachers differed depending on their age. Levene's test suggests data violated the equality of variance assumption ($p = .001 < .05$). Social attitude score was statistically significantly different between student-teachers of various age groups, Welch's $F (3, 335.8) = 8.233$, $p = 0.001$. The results suggest that social knowingness score increased with the increase in age i.e., 19-21 year (3.47 ± 0.86), 22-24 Years (3.60 ± 0.78), 25-27 Years (3.62 ± 0.80), to 28 & above (3.89 ± 0.79). Similarly, Games-Howell test result suggest that student-teachers belonging to age group 28 & above have significantly different and higher mean social attitude scores compared to the student-teacher of 19-21 years age group [(.41, 95% CI (.19 to .63), $p < .0005$], 22-24 years age group [(.28, 95% CI (.07 to .49), $p < .0005$], and 25-27 years age group [(.25, 95% CI (.06 to .45), $p < .0005$] respectively.

Table 4.37

Post Hoc Results for Social Attitude Scores Based on Age

	Age(I)	Age(J)	Mean Diff(I-J)	SE	Sig.	95% CI	
						LB	UB
	22-24	19-21	0.13	0.08	0.43	-0.09	0.35
	25-27	19-21	0.15	0.08	0.21	-0.05	0.36
Games-		22-24	0.03	0.07	0.98	-0.16	0.22
Howell		19-21	0.41*	0.09	0.000	0.19	0.63
	28 & above	22-24	0.28*	0.08	0.003	0.07	0.49
		25-27	0.25*	0.07	0.004	0.06	0.45

LB = *Lower Bound*; UB = *Upper Bound*

* *Significance level = 0.05.*

4.4.4.6 Economic Attitude

Table 4.38

Students-Teachers' Economic Attitude Based on Their Age (H04f)

Age	N	M	Std Dev	F	P
19-21 Years	187	3.63	1.03		
22-24 Years	193	3.42	1.15	4.328	0.005
25-27 Years	284	3.74	1.01		
28 & above	89	3.80	0.87		
Total	**753**	**3.64**	**1.04**		

Table 4.38 displays the average and standard deviation of economic attitudes among student-teachers based on age. To find out whether there are differences in economic attitude among student-teachers based on their age, we performed a one-way Welch ANOVA. The results suggest economic attitude score was statistically significantly different between student-teachers of various ages, Welch's $F_{(3, 319.92)}$ = 4.328, p = 0.005. Similarly, Games-Howell test suggest that the student-teachers belonging to age group 28 & above have significantly different and higher mean economic attitude scores compared to the student-teacher of 22-24 years age group [(.38, 95% CI (.06 to .70), p < .01]. Similarly, the student-teachers belonging to age

group 25-27 years have significantly different and higher mean economic attitude scores compared to the student-teacher of 22-24 years age group [(.33, 95% CI (.06 to.59), p <.01].

Table 4.39

Post Hoc Results for Economic Attitude Scores Based on Their Age

	Age(I)	Age(J)	Mean Diff(I-J)	SE	Sig.	95% CI	
						LB	UB
	19-21	22-24	0.21	0.11	0.25	-0.08	0.50
	25-27	19-21	0.12	0.10	0.61	-0.13	0.37
Games-		22-24	0.33*	0.10	0.01	0.06	0.59
Howell		19-21	0.18	0.12	0.45	-0.13	0.48
	28 & above	22-24	0.38*	0.12	0.01	0.06	0.70
		25-27	0.06	0.11	0.95	-0.23	0.34

LB = *Lower Bound*; UB = *Upper Bound*

* *Significance level = 0.05*.

4.4.4.7 Environmental Behavior

Table 4.40

Students-Teachers' Environmental Behavior Based on Their Age (H04g)

Age	N	M	Std Dev	F	P
19-21 Years	187	2.61	0.94		
22-24 Years	193	2.71	1.00		
25-27 Years	284	2.74	1.02	2.292	0.07
28 & above	89	2.94	1.04		
Total	**753**	**2.73**	**1.00**		

Table 4.40 displays the average and standard deviation of environmental behavior among student-teachers based on age. One-way ANOVA was used to find out whether there are differences in environmental behavior among student-teachers belongs to different age group. Levene's test suggests data violate the equality of variance assumption (p = 0.011). One-way Welch ANOVA shows no statistically

significant variation in student-teachers' environmental behavior of various age groups. i.e., p = 0.07 > 0.05.

4.4.4.8 Social Behavior

Table 4.41

Students-Teachers' Social Behavior Based on Their Age (H04h)

Age	N	M	Std Dev	F	P
19-21 Years	187	3.06	1.09		
22-24 Years	193	3.12	1.04		
25-27 Years	284	3.10	1.05	0.421	0.738
28 & above	89	3.21	1.02		
Total	**753**	**3.11**	**1.05**		

Table 4.41 displays the results for social behaviors of student-teachers enrolled in various years. A score higher than three indicates that student-teachers, regardless of year, display an appropriate social behavior for SD. We performed a one-way ANOVA to find out whether there are differences in social behavior among student-teachers belongs to different age group. Levene's test suggests data violate the equality of variance assumption (p = 0.03). One-way Welch ANOVA shows no statistically significant variation in student-teachers' social behavior of various age groups. i.e., p = 0.379 > 0.05.

4.4.4.9 Economic Behavior

Table 4.42

Students-Teachers' Economic Behavior Based on Their Age (H04i)

Age	N	M	Std Dev	F	p
19-21 Years	187	2.87	1.17		
22-24 Years	193	2.98	1.21		
25-27 Years	284	3.03	1.16	2.725	0.043
28 & above	89	3.30	1.14		
Total	**753**	**3.01**	**1.18**		

Table 4.42 displays the average and standard deviation of economic behavior among student-teachers based on age. To find out whether there are differences in economic attitude among student-teachers based on their age, we performed a one-way ANOVA. The results suggest economic behavior score was statistically significantly different between student-teachers of various age groups, $F(3, 749) = 2.725$, $p = 0.043$. Similarly, Tukey post hoc analysis revealed that the student-teachers belonging to age group 28 & above have significantly different and higher mean economic behavior scores compared to the student-teacher of 19-21 years age group [(.42, 95% CI (.04 to .82), $p < .03$].

Table 4.43

Post Hoc Results for Economic Attitude Scores Based on Their Age.

	Age(I)	Age(J)	Mean Diff(I-J)	SE	Sig.	95% CI LB	95% CI UB
	22-24	19-21	0.11	0.12	0.78	-0.20	0.43
		19-21	0.15	0.10	0.49	-0.13	0.44
	25-27						
Tukey Post		22-24	0.04	0.11	0.98	-0.24	0.33
Hoc		19-21	0.43*	0.15	0.02	0.04	0.81
	28 & above	22-24	0.32	0.14	0.15	-0.06	0.70
		25-27	0.27	0.14	0.20	-0.08	0.63

4.4.5 Analysis of student-teachers' sustainability consciousness based on academic program.

Objective 4c. *To explore the differences in student-teachers' sustainability consciousness based on academic programs.*

H₀5: *There is no significant difference in the sustainability consciousness of student-teachers' based on their enrollment in various academic programs.*

4.4.5.1 Environmental Knowingness

Table 4.44

Students-teachers' Environmental Knowingness Based on the Academic Program
(H05a)

Program	N	M	Std Dev	F	p
BS Education	355	3.46	1.03		
B.Ed Secondary	122	3.60	1.07	2.503	0.083
B.Ed Elementary	276	3.36	0.99		
Total	**753**	**3.45**	**1.02**		

Table 4.44 provides the means and standard deviation of student-teachers'
environmental knowingness. Student-teachers enrolled in different educational
programs exhibit above-average knowledge pertinent to environmental issues.
Moreover, the Levene's test results suggested that the data satisfies the equality of
variance assumption ($p = 0.476 > 0.05$). In order to assess program-based differences
in the mean scores of environmental knowingness, ANOVA test was applied. Table
4.44 summarizes the results of ANOVA for environmental knowingness. According to
the data, no significant difference can be explained in student-teachers' environmental
knowingness based on the teacher education program they are enrolled in ($F (2, 750) =$
$2.503, p = 0.083$).

4.4.5.2 Social Knowingness

Table 4.45

Students-Teachers' Social Knowingness Based on The Academic Program (H05b)

Program	N	M	Std Dev	F	P
BS Education	355	3.92	0.85		
B.Ed Secondary	122	3.93	0.86	0.009	0.991
B.Ed Elementary	276	3.93	0.87		
Total	**753**	**3.93**	**0.86**		

Table 4.45 provides the means and standard deviation on social knowingness of student-teachers. Student-teachers studying in various educational programs exhibit a fair social knowledge toward SD. Moreover, the Levene's test results suggested that the data satisfies the equality of variance assumption (p = 0.803 > 0.05. AVOVA was applied to assess program-based differences in the mean scores of social knowingness. According to the data, no significant difference can be explained in student-teachers' social knowingness based on the teacher education program they are enrolled in (F (2, 750) = 0.009, p = 0.991).

4.4.5.3 Economic Knowingness

Table 4.46

Students-Teachers' Economic Knowingness Based on The Academic Program (H05c)

Program	N	M	Std Dev	F	P
BS Education	355	3.09	1.20		
B.Ed Secondary	122	2.92	1.20	1.384	0.251
B.Ed Elementary	276	2.97	1.14		
Total	**753**	**3.02**	**1.18**		

Table 4.46 provides the means and standard deviation on economic knowingness of student-teachers enrolled in various teacher-education programs. Student-teachers studying in various educational programs exhibit an average to below average economic knowledge toward SD. The overall economic knowledge score was less than three suggesting that overall student-teachers have low economic knowledge irrespective of the program they are enrolled in. the Levene's test results suggested that the data satisfies the equality of variance assumption (p = 0.07 > 0.05). In order to assess program-based differences in the mean scores of economic knowingness, ANOVA test was applied. (See Table 4.46). According to the data, no significant difference can be explained in student-teachers' economic knowingness based on the teacher education program they are enrolled in (F (2, 750) = 1.384, p = 0.251).

4.4.5.4 Environmental Attitude

Table 4.47

Students-Teachers' Environmental Attitude Based on The Academic Program (H05d)

Program	N	M	Std Dev	F	p
BS Education	355	3.62	1.05		
B.Ed Secondary	122	3.73	1.01	1.137	0.321
B.Ed Elementary	276	3.59	1.04		
Total	**753**	**3.65**	**1.04**		

The mean and standard deviation of student-teachers' environmental attitudes are presented in Table 4.47 Student-teachers studying in different educational programs exhibited a positive and above average environmental attitude toward SD. The fact that the aggregate score for environmental attitude was higher than three indicates that student-teachers, in general, have a positive attitude toward the environment, regardless of the teacher-education program in which they are enrolled. In addition, the Levene's test results suggested that the data fulfill the equality of variance assumption ($p = 0.631 > 0.05$), which means that the homogeneity of variance was preserved. In order to assess program-based differences in the mean scores of environmental attitudes, ANOVA was applied (see Table 4.47). According to the data, no significant difference can be explained in student-teachers' environmental attitudes based on the teacher education program they are enrolled in ($F (2, 750) = 1.137$, $p = 0.321$).

4.4.5.5 Social Attitude

Table 4.48

Students-Teachers' Social Attitude Based on The Academic Program (H05e)

Program	N	M	Std Dev	F	p
BS Education	355	3.61	0.78		
B.Ed Secondary	122	3.52	0.86	1.365	0.256
B.Ed Elementary	276	3.66	0.78		
Total	**753**	**3.61**	**0.79**		

The mean and standard deviation of student-teachers' social attitudes are presented in Table 4.48. Student-teachers enrolled in different educational programs have a positive and above average social attitude toward SD. The fact that the aggregate score for environmental attitude was higher than three indicates that student-teachers, in general, have a positive attitude toward the social issues, regardless of the teacher-education program in which they are enrolled. In addition, the Levene's test results suggested that the data met the equality of variance assumption ($p = 0.260 > 0.05$).

In order to determine any difference in the participants' mean social attitudes score from one program to another, a one-way ANOVA was conducted. No significant difference can be explained in student-teachers' social attitudes based on the teacher education program they are enrolled in ($F (2, 750) = 1.365$, $p = 0.256$).

4.4.5.6 Economic Attitude

Table 4.49

Students-Teachers' Economic Attitude Based on The Academic Program (H05f)

Program	N	M	Std Dev	F	P
BS Education	355	3.71	1.03		
B.Ed Secondary	122	3.65	1.00	1.722	0.179
B.Ed Elementary	276	3.55	1.08		
Total	**753**	**3.64**	**1.05**		

Table 4.49 displays the results for the economic attitudes of student-teachers studying in various teacher-education programs. Student-teachers enrolled in a range of educational programs have a much more positive economic attitude toward SD. The fact that the aggregate score for economic attitude was more than three suggests that student-teachers have a favorable attitude towards economic problems. In addition, the Levene's test results suggested that the data fulfills the equality of variance assumption ($p = 0.102 > 0.05$). In order to determine any difference in the participants' mean

economic attitudes score from one program to another, a one-way ANOVA was carried out. Table 4.49 summarizes the one-way ANOVA results on economic attitudes. According to the Table 4.49, no significant difference can be explained in student-teachers' economic attitudes based on the teacher education program they are enrolled in (F (2, 750) = 1.722, p = 0.179).

4.4.5.7 Environmental Behavior

Table 4.50

Students-teachers' Environmental Behavior Based on The Academic Program (H05g)

Program	N	M	Std Dev	F	p
BS Education	355	2.70	1.03		
B.Ed Secondary	122	2.69	0.98	0.306	0.736
B.Ed Elementary	276	2.76	0.99		
Total	**753**	**2.72**	**1.01**		

The mean and standard deviation of environmental behaviors of student-teachers enrolled in different teacher-education programs are shown in Table 4.50. The Levene's test results suggested that the data satisfies the equality of variance assumption (p = 0.459 > 0.05). ANOVA was applied in order to evaluate any difference in the student-teachers' environmental behaviors scores. The one-way ANOVA on environmental behaviors is shown in Table 4.50. According to the data in Table 4.50, no significant difference can be explained in student-teachers' environmental behavior based on the teacher education program they are enrolled in i.e., (F (2, 750) = 0.306, p = 0.736).

4.4.5.8 Social Behavior

Table 4.51

Students-teachers' Social Behavior Based on the Academic Program (H05h)

Program	N	M	Std Dev	F	P
BS Education	355	3.08	1.05		
B.Ed Secondary	122	3.18	1.00	0.455	0.635
B.Ed Elementary	276	3.12	1.07		
Total	**753**	**3.11**	**1.05**		

Table 4.51 displays the mean and standard deviation of social behaviors of student-teachers enrolled in various teacher-education programs. Student-teachers engaged in a range of educational programs exhibited social behaviors towards SD. The fact that the aggregate score for social behaviors was somewhat higher than three shows that student-teachers, independent of the teacher-education program in which they are enrolled, exhibit favorable social behaviors. Furthermore, the Levene's test results suggested that the data fulfill the equality of variance assumption ($p > 0.05$).

Difference in participants' mean social behaviors scores based on program were examined using a one-way ANOVA (see Table 4.51). Student-teachers in different teacher-education programs did not exhibit any statistically significant difference in social behaviors, as shown in Table 4.51 i.e., (F (2, 750) = 0.455, p = 0.635).

4.4.5.9 Economic Behavior

Table 4.52

Students-Teachers' Economic Behavior Based on The Academic Program (H05i)

Program	N	M	Std Dev	F	p
BS Education	355	2.47	1.02		
B.Ed Secondary	122	2.40	1.07	0.167	0.846
B.Ed Elementary	276	2.39	1.00		
Total	**753**	**2.43**	**1.02**		

Table 4.52 depicts the mean and standard deviation of the economic behaviors of student-teachers enrolled in different teacher-education program. Participating in a variety of educational programs, student-teachers reported economic behaviors towards SD. The fact that the aggregate score for economic behaviors was slightly below three indicates that student-teachers demonstrate a poor economic behavior regardless of the teacher-education program in which they are enrolled. In addition, the Levene's test results suggested that the data met the equality of variance assumption (p = 0.703 > 0.05). Difference in participants' mean economic behaviors scores based on program were examined using a one-way ANOVA. Student-teachers in different teacher-education programs did not exhibit any statistically significant difference in economic behaviors (F (2, 750) = 0.167, p = 0.846).

4.4.6 **Analysis of student-teachers' sustainability consciousness based on year of study.**

Objective 4d. *to analyze the differences in student-teachers' sustainability consciousness based on years of the study.*

H$_0$6: *There is no. significant difference in the student-teachers' sustainability consciousness based on year of the study.*

4.4.6.1 Environmental Knowingness

Table 4.53

Students-Teachers' Environmental Knowingness Based on The Year of Study (H06a)

Year of study	N	M	Std Dev	F	p
1st	227	3.41	1.02		
2nd	183	3.38	1.08	2.042	0.107
3rd	204	3.43	1.04		
4th	139	3.62	0.91		
Total	**753**	**3.45**	**1.02**		

Table 4.53 depicts the mean and standard deviation of the environmental knowingness of student-teachers based on the year they are currently studying. The fact that the aggregate score for environmental knowingness was above three indicates that student-teachers demonstrate an above average environmental knowingness regardless of the year they were currently studying in. In addition, the Levene's test results suggested that the data violated the equality of variance assumption ($p = 0.0005 < 0.05$). To find out whether there are differences in environmental knowingness among student-teachers enrolled in different years, we performed a one-way Welch ANOVA. According to the results of Welch one-way ANOVA, student-teachers studying in various years does not have a significant difference in the environmental knowingness. i.e., $p = 0.107 > 0.05$.

4.4.6.2 Social Knowingness

Table 4.54

Students-Teachers' Social Knowingness Based on The Year of Study (H06b)

Year of study	N	M	Std Dev	F	P
1st	227	3.75	1.00		
2nd	183	3.82	0.89	9.672	0.0005
3rd	204	4.09	0.69		
4th	139	4.11	0.68		
Total	**753**	**3.93**	**0.85**		

Table 4.54 depicts the year of study based mean and standard deviation of the student-teachers' social knowingness. The fact that the aggregate score for social knowingness was above three indicates that student-teachers demonstrate an above average social knowingness regardless of the year they were currently studying in.

A one-way Welch ANOVA was applied to assess student-teachers' social knowingness is different for student-teachers studying in various years. The subjects were divided into four categories: student-teachers studying in their 1st year (n = 227),

2nd year (n = 183), 3rd year (n = 204), and 4th year (n = 139) respectively. Levene's test suggests data violated the equality of variance assumption (p = .0005). Social knowingness score increased with the increase in year i.e., 1st year (3.74 ± 0.99), to 2nd (3.82 ± 0.89), to 3rd (4.09 ± 0.69) to 4th (4.11 ± 0.68). Social attitude score was statistically significantly different between student-teachers studying in different years, Welch's F (3, 399.61) = 9.657, p = 0.0005. Results of Games-Howell test suggests that no significant difference in the mean scores of 1st and 2nd year student-teachers' social knowingness was found i.e., p > 0.05. Similarly, Results of Games-Howell test suggests that the student-teachers enrolled in 3rd year have significantly different and higher mean social knowingness scores compared to the student-teacher studying in 1st [(.35, 95% CI (.14 to .56), p < .0005] and 2nd (.27, 95% CI (.060 to .48) p = .006] years respectively. Similarly, the results of the Games-Howell post hoc analysis revealed that the student-teachers enrolled in 4th year have significantly higher mean social knowingness compared to the student-teacher studying in 1st [(.36, 95% CI (.14 to.59), p <.0005] and 2nd (.29, 95% CI (.06 to.51) p =.005] years respectively. Moreover, 3rd and 4th year student-teachers' social knowingness exhibited similar mean score. The results are summarized in Table 4.55.

Table 4.55

Post Hoc Results for Social Knowingness Scores Based on Year Of Study

	Year of study(I)	Year of study(J)	Mean Diff(I-J)	SE	Sig.	95% CI LB	95% CI UB
	2nd	1st	.08	.09	.849	-0.17	0.32
	3rd	1st	.35*	.08	.000	0.14	0.56
Games-Howell		2nd	.27*	.08	.006	0.06	0.48
	4th	1st	.37*	.09	.000	0.14	0.59
		2nd	.29*	.09	.005	0.07	0.52
		3rd	.02	.08	.993	-0.17	0.21

LB = *Lower Bound*; UB = *Upper Bound*
* *Significance level = 0.05.*

4.4.6.3 Economic Knowingness

Table 4.56

Students-Teachers' Economic Knowingness Based on The Year of Study (H06c)

Year of study	N	M	Std Dev	F	P
1st	227	3.13	1.20		
2nd	183	3.05	1.17		
3rd	204	2.95	1.19	1.546	0.201
4th	139	2.88	1.14		
Total	**753**	**3.02**	**1.18**		

Table 4.56 shows the average and standard deviation of student-teachers' economic knowledge by year. An economic knowledge score below three implies that student-teachers, no matter what year they are presently enrolled in, have a lack of economic knowledge. To find out whether there are differences in environmental attitude among preservice teachers enrolled in different years, we performed a one-way ANOVA. Levene's test suggests data fulfill the equality of variance assumption ($p = 0.186$). ANOVA shows no statistically significant variation in student-teachers' economic attitudes over the various years. i.e., $p = 0.201 > 0.05$.

4.4.6.4 Environmental Attitude

Table 4.57

Students-Teachers' Environmental Attitude Based on the Year of Study (H06d)

Year of study	N	M	Std Dev	F	P
1st	227	3.60	1.06		
2nd	183	3.68	1.03		
3rd	204	3.61	1.08	1.014	0.386
4th	139	3.78	0.95		
Total	**753**	**3.65**	**1.04**		

Table 4.57 shows the average and standard deviation of student-teachers' environmental attitude by year. An environmental attitude scores greater than three

implies that student-teachers, no matter what year they are presently enrolled in, have a fair attitude towards the environmental issues. To find out whether there are differences in environmental attitude among preservice teachers enrolled in different years, we performed a one-way Welch ANOVA. Levene's test suggests data violated the equality of variance assumption (p = .06 > 0.05). One-way ANOVA results showed no statistically significant variations in the environmental attitude of student-teacher studying in various years i.e., p = 0.386 > 0.05.

4.4.6.5 Social Attitude

Table 4.58

Students-Teachers' Social Attitude Based on The Year of Study (H06e)

Year of study	N	M	Std Dev	F	p
1st	227	3.49	0.80		
2nd	183	3.58	0.87		
3rd	204	3.63	0.79	7.045	0.0005
4th	139	3.83	0.63		
Total	**753**	**3.61**	**0.79**		

Table 4.58 displays the average and standard deviation of social attitudes among student-teachers by year. A social attitude score of three or above indicates that student-teachers, regardless of year, have a reasonable attitude toward economic matters. Welch ANOVA was used to investigate whether the social attitudes of student-teachers differed depending on the year of study, they were enrolled in. Levene's test suggests data violated the equality of variance assumption (p = .006 < 0.05). Social attitude score was statistically significantly different between student-teachers studying in different years, Welch's F (3, 402.224) = 7.045, p < 0.0005. Social attitude score increased with the increase in year i.e., 1st year (3.49 ± 0.80), to 2nd (3.58 ± 0.87), to 3rd (3.62 ± 0.79) to 4th (3.83 ± 0.63). Moreover, results of the Games-Howell test suggests that student-teachers studying in 4th year have significantly higher social

attitude compared to the student-teacher studying in 1st [(.33, 95% CI (.14 to .53), p <

.0005], 2nd (.25, 95% CI (.03 to .47) p = .016], and 3rd (.20, 95% CI (.006 to .40), p =

.040] years respectively. Moreover, no statistically significant difference in social

attitude was detected in the other combinations. i.e., p > 0.05.

Table 4.59

Post Hoc Results for Social Attitude Scores Based on Year of Study

	Year of study (I)	Year of study (J)	Mean Diff (I-J)	SE	Sig.	95% CI LB	UB
	2nd	1st	0.09	0.08	.731	-0.13	0.30
	3rd	1st	0.13	0.08	.316	-0.07	0.33
Games-		2nd	0.05	0.08	.950	-0.17	0.26
Howell		1st	0.34*	0.08	.000	0.14	0.53
	4th	2nd	0.25*	0.08	.016	0.03	0.47
		3rd	0.20*	0.08	.040	0.01	0.40

LB = *Lower Bound*; UB = *Upper Bound*

* *Significance level = 0.05*.

4.4.6.6 Economic Attitude

Table 4.60

Students-teachers' Economic Attitude based on the Year of Study (H06f)

Year of study	N	M	Std Dev	F	P
1st	227	3.52	1.08		
2nd	183	3.63	1.07		
3rd	204	3.67	1.04	2.290	0.078
4th	139	3.80	0.93		
Total	**753**	**3.64**	**1.04**		

Table 4.60 displays the average and standard deviation of economic attitudes

among student-teachers by year. An economic attitude score of three or above indicates

that student-teachers, regardless of year, have a reasonable attitude toward economic

dimension of SD. To find out whether there are differences in economic attitude among

preservice teachers enrolled in different years, we performed a one-way Welch ANOVA. Levene's test suggests data violated the equality of variance assumption ($p = .013 < 0.05$). According to the results of one-way ANOVA, student-teachers studying in various years does not have a significant difference in the economic attitude. i.e., $p = 0.078 > 0.05$.

4.4.6.7 Environmental Behavior

Table 4.61

Students-Teachers' Environmental Behavior Based on the Year of Study (H06g)

Year of study	N	M	Std Dev	F	P
1st	227	2.67	1.02		
2nd	183	2.63	0.94		
3rd	204	2.87	1.04	2.075	0.10
4th	139	2.72	1.01		
Total	**753**	**2.72**	**1.01**		

The average and standard deviation of the environmental behaviors of student-teachers enrolled in different years are shown in Table 4.61. A score of less than three shows that, regardless of year, student-teachers demonstrate a lack of SD-oriented environmental behaviors. To find out whether there are differences in environmental behavior among student-teachers enrolled in different years, we performed a one-way Welch ANOVA. Levene's test suggests data violated the equality of variance assumption ($p = .005 < 0.05$). According to the results of Welch one-way ANOVA, student-teachers studying in various years does not have a significant difference in the environmental behavior. i.e., $p = 0.10 > 0.05$.

4.4.6.8 Social Behavior

Table 4.62

Students-Teachers' Social Behavior Based on The Year of Study (H06h)

Year of study		N	M	Std Dev	F	p
1st		227	3.05	1.06		
2nd		183	3.14	1.08		
3rd		204	3.18	1.02	0.710	0.546
4th		139	3.06	1.06		
	Total	**753**	**3.11**	**1.05**		

Table 4.62 displays the results of the social behaviors of student-teachers enrolled in various years. A score higher than three indicates that student-teachers, regardless of year, display an appropriate social behavior for SD. ANOVA was utilized to assess difference in social behaviors of student-teachers. The Levene test of homogeneity of variances showed that the variances were homogenous (p =.167 > 0.05). The finds of the ANOVA suggest that no significant difference was found in the social behaviors of student-teachers studying in different years (p = 0.546 > 0.05).

4.4.6.9 Economic Behavior

Table 4.63

Students-Teachers' Economic Behavior Based on The Year of Study (H06i)

Year of study		N	M	Std Dev	F	P
1st		227	2.87	1.20		
2nd		183	3.03	1.17		
3rd		204	3.07	1.18	1.655	0.175
4th		139	3.11	1.13		
	Total	**753**	**3.01**	**1.18**		

Table 4.63 displays the results for economic behaviors of student-teachers enrolled in various years. A score below than three indicates that student-teachers, regardless of year, display a lack of economic behaviors towards SD. Welch ANOVA

was conducted to assess any difference in the economic behaviors of student-teachers across years. The Levene test of homogeneity of variances showed that the variances were homogeneous (p =.515 > 0.05). According to the findings of the one-way ANOVA, no significant difference was found in the economic behaviors of student-teachers studying in different years, (p = 0.175 > 0.05). Moreover, the result does not suggest any conclusive results that increase in the year results in increase in economic behaviors pertinent to SD.

4.4.7 **Analysis of student-teachers' sustainability consciousness based on educational institutions.**

Objective 4e. *To investigate the differences in in student-teachers' sustainability consciousness based on institutions enrolled in.*

H₀7: There is no significant difference in the SC of student-teachers' studying in various educational institution.

4.4.7.1 Environmental Knowingness

Table 4.64

Student-Teachers' Environmental Knowingness Based on The University Student-Teachers' Enrolled In (H07a)

Institution	N	M	Std Dev	F	p
Institution 1	170	3.56	1.08		
Institution 2	60	3.21	1.01		
Institution 3	79	3.41	0.95		
Institution 4	53	3.35	1.07	1.598	0.145
Institution 5	84	3.42	0.95		
Institution 6	185	3.38	0.97		
Institution 7	122	3.60	1.07		
Total	**753**	**3.45**	**1.02**		

The Table 4.64 displays the average and standard deviation for student-teachers' environmental knowingness studying in various educational institutions. The findings imply that student-teachers had above-average environmental knowledge. The Mean score of student-teachers' environmental knowingness in all the educational institutions is above average. Moreover, the Levene's test results suggested that the data comply with the equality of variance assumption i.e., p = 0.231. Table 4.64 provides the results of one-way ANOVA for student-teachers' environmental knowingness based on the educational institutions they are currently studying in. The results suggest that no significant difference can be explained in student-teachers' environmental knowingness based on their educational institutions i.e., F (6, 746) = 1, p = 0.145.

4.4.7.2 Social Knowingness

Table 4.65

Students-Teachers' Of Social Knowingness Based on The University Student-Teachers' Enrolled In (H07b)

Institution	N	M	Std Dev	F	P
Institution 1	170	3.91	0.83		
Institution 2	60	3.78	1.01		
Institution 3	79	3.84	0.91		
Institution 4	53	3.99	0.88	1.216	0.298
Institution 5	84	4.10	0.68		
Institution 6	185	3.93	0.86		
Institution 7	122	3.93	0.86		
Total	**753**	**3.93**	**0.86**		

The Table 4.65 present the descriptive statistics of student-teachers' social knowingness studying in various educational institutions. The results suggest that student-teachers studying in these selected educational institutions have positive and above average social knowingness. Moreover, the Levene's test results suggested that

the data did not comply with the equality of variance assumption (p = 0.029 < 0.05). Table 4.65 provides the results of Welch ANOVA for student-teachers' social knowingness based on the educational institutions they are currently studying in. The results suggest that no significant difference can be explained in student-teachers' social knowingness based on their educational institutions i.e., F (6, 746) = 1.216, p = 0.298.

4.4.7.3 Economic Knowingness

Table 4.66

Students-Teachers' Of Economic Knowingness Based on The University Student-Teachers' Enrolled In (H07c)

Institution	N	M	Std Dev	F	P
Institution 1	170	3.15	1.17		
Institution 2	60	3.04	1.20		
Institution 3	79	3.15	1.15		
Institution 4	53	2.73	1.07	1.467	0.190
Institution 5	84	2.89	1.12		
Institution 6	185	3.04	1.22		
Institution 7	122	2.92	1.20		
Total	**753**	**3.02**	**1.18**		

The descriptive data on the economic knowledge of student-teachers are shown in Table 4.66. The student-teachers at these educational institutions seem to have average economic knowledge, based on the data. The Levene's test results suggested that the data did not comply with the equality of variance assumption (p = 0.035 < 0.05).

The findings of a Welch analysis of variance for student-teachers' economic knowledge are shown in Table 4.66. These findings are based on the educational institutions in which the student-teachers are presently enrolled. The results suggest that no significant difference can be explained in student-teachers' economic knowingness based on their educational institutions (i.e., F (6, 746) = 1.467, p = 0.190).

4.4.7.4 Environmental Attitude

Table 4.67

Students-Teachers' Of Environmental Attitude Based on The University Student-Teachers' Enrolled In (H07d)

Institution	N	M	Std Dev	F	P
Institution 1	170	3.62	1.04		
Institution 2	60	3.81	1.00		
Institution 3	79	3.72	1.00		
Institution 4	53	3.72	1.05	0.469	0.832
Institution 5	84	3.68	1.10		
Institution 6	185	3.62	1.06		
Institution 7	122	3.59	1.01		
Total	**753**	**3.65**	**1.04**		

The descriptive data on the environmental attitude of student-teachers are shown in Table 4.67. The student-teachers at these educational institutions seem to have a positive and above average environmental attitude, based on the data. In addition, the Levene's test results suggested that the data fulfill the equality of variance assumption ($p = 0.764 > 0.05$). Table 4.67 displays the results of a one-way analysis of variance for student-teachers' environmental attitudes enrolled in various educational institutions. According to the results, no significant difference can be explained in student-teachers' environmental attitude based on the educational institution they were studying in (i.e., $F (6, 746) = 0.469$, $p = 0.832$).

4.4.7.5 Social Attitude

Table 4.68

Students-Teachers' Of Social Attitude Based on The University Student-Teachers'
Enrolled In (H07e)

Institution	N	M	Std Dev	F	p
Institution 1	170	3.60	0.77		
Institution 2	60	3.76	0.73		
Institution 3	79	3.62	0.77		
Institution 4	53	3.67	0.74	0.730	0.626
Institution 5	84	3.61	0.86		
Institution 6	185	3.63	0.79		
Institution 7	122	3.52	0.86		
Total	**753**	**3.61**	**0.79**		

Table 4.68 displays descriptive statistics on student-teachers' social attitudes. Student-teachers at seven different educational institutions seem to have a favorable and above-average attitude toward the environment. the Levene's test results suggested that the data comply with the equality of variance assumption ($p = 0.599 > 0.05$).

Table 4.68 shows the results of a one-way ANOVA for the social attitudes of student-teachers enrolled in different educational institutions. According to the results, no significant difference can be explained in student-teachers' social attitude based on the educational institution they were studying in i.e., $F(6, 746) = 0.730$, $p = 0.626$.

4.4.7.6 Economic Attitude

Table 4.69

Students-Teachers' Of Economic Attitude Based on The University Student-Teachers'
Enrolled In (H07f)

Institution	N	M	Std Dev	F	p
Institution 1	170	3.65	1.07		
Institution 2	60	3.48	1.08		
Institution 3	79	3.67	1.06		
Institution 4	53	3.45	1.14	1.034	0.402
Institution 5	84	3.54	1.07		
Institution 6	185	3.76	0.99		
Institution 7	122	3.65	1.00		
Total	**753**	**3.64**	**1.04**		

The descriptive statistic on student-teachers' economic attitudes are shown in Table 4.69. It appears that student-teachers at selected seven different educational institutions have a positive and above average attitude towards SD. In addition, the Levene's test results suggested that the data fulfill the equality of variance assumption ($p = 0.252 > 0.05$).

One-way ANOVA was conducted on the economic attitudes of student-teachers attending a variety of educational institutions. According to the results, no significant difference can be explained in student-teachers' economic attitude based on the educational institution they were studying in i.e., $F (6, 746) = 1.034$, $p = 0.402$.

4.4.7.7 Environmental Behavior

Table 4.70

Students-Teachers' Of Environmental Behavior Based on The University Student-Teachers' Enrolled In (H07g)

Institution	N	M	Std Dev	F	p
Institution 1	170	2.66	1.01		
Institution 2	60	2.60	0.88		
Institution 3	79	2.61	0.99		
Institution 4	53	2.95	1.04	1.327	0.243
Institution 5	84	2.90	1.00		
Institution 6	185	2.75	1.05		
Institution 7	122	2.69	0.98		
Total	**753**	**2.72**	**1.01**		

The descriptive statistics on the environmental behaviors of student-teachers are provided in Table 4.70. In addition, the Levene's test results suggested that the data comply with the equality of variance assumption ($p = 0.079 > 0.05$). A one-way ANOVA was performed on the environmental behaviors of student-teachers attending a variety of educational institutions, and the findings are shown in Table 4.70. According to the results, no significant difference can be explained in student-teachers' environmental behaviors based on the educational institution they were studying in (i.e., $F (6, 746) = 1.327$, $p = 0.243$).

4.4.7.8 Social Behavior

Table 4.71

*Students-Teachers' Of Social Behavior Based on The University Student-Teachers'
Enrolled In (H07h)*

University	N	M	Std Dev	F	p
Institution 1	170	3.05	1.06		
Institution 2	60	2.91	1.06		
Institution 3	79	2.95	1.11		
Institution 4	53	3.26	1.14	1.580	0.150
Institution 5	84	3.32	1.08		
Institution 6	185	3.10	1.07		
Institution 7	122	3.18	1.03		
Total	**753**	**3.11**	**1.07**		

Table 4.71 provides the descriptive data on environmental behaviors of student-teachers. Student-teachers seem to exhibit above-average behaviors toward SD. Moreover, the Levene's test results suggested that the data fulfill the equality of variance assumption ($p = 0.297 > 0.05$).

Table 4.71 shows the results of a one-way ANOVA on the social behaviors of student-teachers from various educational institutions. According to the results, no significant difference can be explained in student-teachers' social behaviors based on the educational institution ($F_{(6, 746)} = 1.580$, $p = 0.150$).

4.4.7.9 Economic Behavior

Table 4.72

Students-Teachers' Of Economic Behavior Based on The University Student-Teachers' Enrolled In (H07i)

Institution	N	M	Std Dev	F	p
Institution 1	170	2.45	1.02		
Institution 2	60	2.28	0.90		
Institution 3	79	2.43	1.03		
Institution 4	53	2.52	1.04	1.343	0.235
Institution 5	84	2.36	1.03		
Institution 6	185	2.49	1.02		
Institution 7	122	2.40	1.07		
Total	**753**	**2.43**	**1.02**		

Table 4.72 provides the descriptive data on environmental behaviors of student-teachers. Student-teachers exhibit below-average behaviors toward SD. Moreover, the Levene's test results suggested that the data satisfies the equality of variance assumption ($p = 0.523 > 0.05$). A one-way ANOVA on the economic behaviors of student-teachers attending a variety of educational institutions, and the findings are shown in Table 4.72. According to the data, no significant difference can be explained in student-teachers' economic behaviors based on the educational institution ($F_{(6, 746)} = 0.460$, $p = 0.838$).

Objective 5: To investigate the effect of teacher-educators' teaching styles on student-teachers' SC.

H$_0$8: There is no significant effect of teacher-educator teaching style and student-teacher SC.

4.4.8 **Structural Analysis**

4.4.9 **Confirmatory factor Analysis**

Examining the measurement model is the first point for evaluating PLS-SEM findings (Hair et al., 2019). Convergent validity, discriminant validity, construct reliability, and multicollinearity are only few of the elements that must be evaluated while assessing a measurement model (Hair et al., 2017; Hair et al., 2016).

Table 4.73

Factor Loading – Teaching Styles

Items / Code	Expert	Formal Authority	Personal Model	Facilitator	Delegator
Exp_1	0.816				
Exp_2	0.850				
Exp_3	0.860				
Exp_4	0.772				
Exp_5	0.821				
Exp_6	0.851				
Exp_7	0.837				
Exp_8	0.832				
F_A_1		0.778			
F_A_2		0.802			
F_A_3		0.779			
F_A_4		0.776			
F_A_5		0.846			
F_A_6		0.856			
F_A_7		0.854			
F_A_8		0.828			
P_M_1			0.881		
P_M_2			0.897		
P_M_3			0.889		
P_M_4			0.929		
P_M_5			0.839		

P_M_6	0.918		
P_M_7	0.945		
P_M_8	0.913		
Fac_1		0.731	
Fac_2		0.862	
Fac_3		0.817	
Fac_4		0.824	
Fac_5		0.783	
Fac_6		0.858	
Fac_7		0.859	
Fac_8		0.836	
Del_1			0.792
Del_2			0.799
Del_3			0.774
Del_4			0.750
Del_5			0.775
Del_6			0.801
Del_7			0.763
Del_8			0.811

Figure 4.1

Measurement Model: Factor Loadings
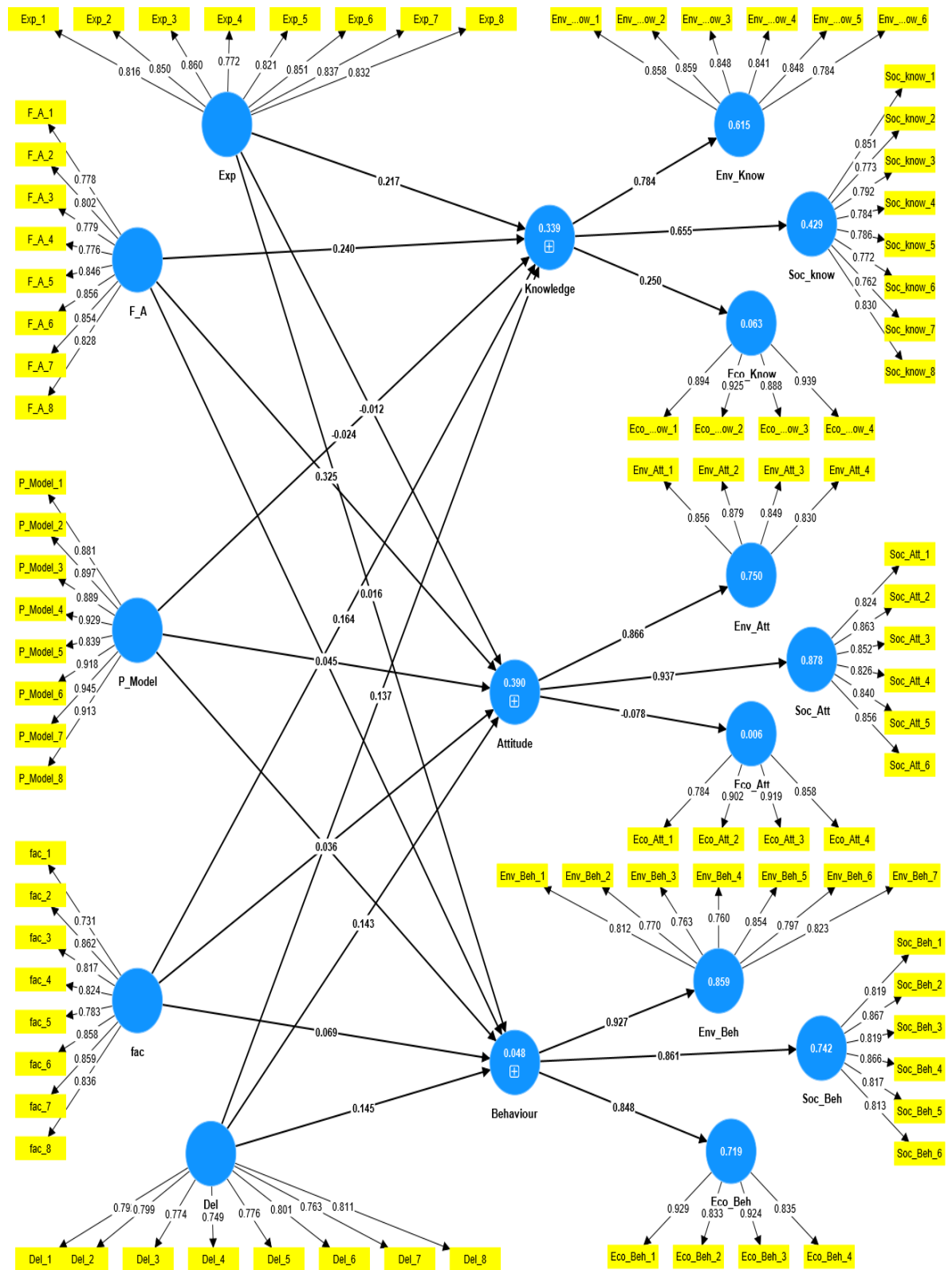
The first step in the assessment of the reflective measurement model is to examine the loadings of the items (Hair et al., 2019). In the literature, various researchers provided different ranges of factor loadings to include or delete a certain item of the construct. For example, Hair et al. (2011) stated a factor loading greater than 0.70 while Truong and McColl (2011) stated any value greater than 0.50 is acceptable to include an item in the analysis. Moreover, Hair et al. (2011) also stated items with low factor loading may be deleted if it results in higher composite reliability (CR).

Table 3.8 provides the factor loadings of all the dimensions of teaching styles. The current research utilizes the criteria proposed by Hair et al. (2011) i.e., factor loadings greater than 0.70 to retain or delete any item. In this analysis, all of the items fulfilled the criteria provided by Hair et al. (2011). Hence, all the items were retained. The results of the factor loadings are summarized in the table above.

Table 4.74

Factors Loading – SC

Dimension	Item	1	2	3	4	5	6	7	8	9
Environmental Knowledge	EnK1	0.86								
	EnK2	0.86								
	EnK3	0.85								
	EnK4	0.84								
	EnK5	0.85								
	EnK6	0.78								
Social Knowledge	SoK1		0.85							
	SoK2		0.77							
	SoK3		0.79							
	SoK4		0.78							
	SoK5		0.79							
	SoK6		0.77							
	SoK7		0.76							
	SoK8		0.83							

	Item	1	2	3	4	5	6	7
Economic Knowledge	EcK1	0.89						
	EcK2	0.92						
	EcK3	0.89						
	EcK4	0.94						
Environmental Attitude	EnAt1		0.86					
	EnAt 2		0.88					
	EnAt 3		0.85					
	EnAt 4		0.83					
Social Attitude	SoAt1			0.82				
	SoAt2			0.86				
	SoAt3			0.85				
	SoAt4			0.83				
	SoAt5			0.84				
	SoAt6			0.86				
Economic Attitude	EcAt1				0.78			
	EcAt2				0.90			
	EcAt3				0.92			
	EcAt4				0.86			
Environmental Behavior	EnB1					0.81		
	EnB2					0.77		
	EnB3					0.76		
	EnB4					0.76		
	EnB5					0.85		
	EnB6					0.80		
	EnB7					0.82		
Social Behavior	SoB1						0.82	
	SoB2						0.87	
	SoB3						0.82	
	SoB4						0.87	
	SoB5						0.82	
	SoB6						0.81	
Economic Behavior	EcB1							0.93
	EcB2							0.83

			0.92
EcB3			0.92
EcB4			0.84

Table 4.74 provides the factor loadings of all the dimensions of SC. In our analysis, all of the items fulfilled the criteria provided by Hair et al. (2011). Factor loadings of all the dimensions of SC are summarized in the table below.

Table 4.75

Reliability And Validity of the Constructs

Dimension	α	CR	AVE
Expert	0.94	0.95	0.69
Formal Authority	0.93	0.94	0.67
Personal Model	0.94	0.93	0.65
Facilitator	0.93	0.94	0.68
Delegator	0.91	0.93	0.61
Environmental Knowingness	0.92	0.93	0.71
Social Knowingness	0.92	0.93	0.63
Economic Knowingness	0.93	0.95	0.83
Environmental Attitude	0.88	0.91	0.73
Social Attitude	0.92	0.94	0.71
Economic Attitude	0.90	0.92	0.75
Environmental Behavior	0.90	0.92	0.64
Social Behavior	0.91	0.93	0.70
Economic Behavior	0.90	0.93	0.78

The construct reliability and validity has been summarized in Table 4.75. Construct validity was ensured through convergent and discriminant validity. Average Variance Extracted (AVE) was used to test convergent validity. Any value over 0.50 means the construct explains 50% of its constituents' variation (Hair et al., 2019). The AVE values given in Table 4.75 shows that all the first constructs have AVE values greater than 0.50.

The last component of the SEM is the assessment of discriminant validity. Various criteria have been discussed in the literature. Three methods have been discussed in the literature to assess discriminant validity i.e., Cross loadings, Fornell-Larcker Criterion, and Heterotrait-Monotrait Ratio (HTMT) (Hair et al., 2012; Henseler et al., 2015). However, in order to ascertain discriminant validity, the current research utilized a relatively recent method i.e., HTMT ratio proposed by Henseler et al. (2015). Two threshold values have been proposed by Kline (2015) and Gold et al. (2001). Kline (2015) proposed relatively conservative criteria i.e., any value less than 0.85 (HTMT 0.85) will indicate a discriminant validity while on the other hand Gold et al. (2001) proposed a relative liberal value of HTMT 0.90. Table 4.76 indicates that discriminant validity has been established as all the values are well below the threshold values.

Table 4.76

HTMT Ratio

	Dimension	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Expert													
2	Formal Authority	0.38												
3	Personal Model	0.06	0.03											
4	Facilitator	0.57	0.60	0.03										
5	Delegator	0.21	0.62	0.03	0.48									
6	Environmental Knowingness	0.58	0.41	0.03	0.53	0.32								
7	Social Knowingness	0.04	0.29	0.04	0.19	0.24	0.10							
8	Economic Knowingness	0.04	0.28	0.03	0.10	0.26	0.02	0.07						
9	Environmental Attitude	0.34	0.57	0.08	0.55	0.47	0.03	0.15	0.04					
10	Social Attitude	0.23	0.55	0.04	0.49	0.44	0.03	0.24	0.03	0.71				
11	Economic Attitude	0.03	0.14	0.06	0.06	0.41	0.03	0.07	0.04	0.08	0.07			
12	Environmental Behavior	0.08	0.12	0.07	0.14	0.18	0.06	0.26	0.10	0.05	0.04	0.04		
13	Social Behavior	0.08	0.07	0.02	0.10	0.09	0.04	0.17	0.05	0.02	0.03	0.03	0.75	
14	Economic Behavior	0.13	0.32	0.04	0.24	0.35	0.15	0.30	0.12	0.16	0.14	0.03	0.80	0.63

Additionally, the Variance Inflation Factor (VIF) values for all first and second-order variables were less than the threshold value of 3. The values of VIF indicate the absence of a multicollinearity issue. The result of the measurement model is given in Table 4.77.

Table 4.77

Variance Inflation Factor (VIF)

Dimension	Items	VIF
Environmental Knowingness	EnK1	2.494
	EnK2	2.506
	EnK3	2.554
	EnK4	2.355
	EnK5	2.486
	EnK6	2.488
Social Knowingness	SoK1	2.899
	SoK2	2.106
	SoK3	2.257
	SoK4	2.146
	SoK5	2.175
	SoK6	2.115
	SoK7	2.053
	SoK8	2.653
Economic Knowingness	EcK1	2.18
	EcK2	2.422
	EcK3	2.342
	EcK4	2.256
Environmental Attitude	EnAt1	2.394
	EnAt 2	2.723
	EnAt 3	2.337
	EnAt 4	2.128
Social Attitude	SoAt1	2.97
	SoAt2	2.771

	SoAt3	2.821
	SoAt4	2.579
	SoAt5	2.712
	SoAt6	2.823
Economic Attitude	EcAt1	2.219
	EcAt2	2.965
	EcAt3	2.82
	EcAt4	2.731
Environmental Behavior	EnB1	2.446
	EnB2	2.031
	EnB3	2.003
	EnB4	1.953
	EnB5	2.834
	EnB6	2.206
	EnB7	2.446
Social Behavior	SoB1	2.261
	SoB2	2.816
	SoB3	2.277
	SoB4	2.285
	SoB5	2.74
	SoB6	2.288
Economic Behavior	EcB1	2.894
	EcB2	1.666
	EcB3	2.838
	EcB4	1.924

The structural model provides the necessary information about the paths hypothesized in the research framework. The predictive strength of the structural model is assessed through the R2, predictive relevance (Q2), and significance of the path coefficients. The strength of each path is determined by the dependent variable R2 value. The value of R2 ranges between 0 to 1. In literature, various threshold has been discussed, however, any value greater than or equal to 0.1 is acceptable (Falk and

Miller, 1992). The values of R2 in the table below suggest that all the variables have R2 values greater than 0.1, hence the predictive strength has been established. Similarly, the predictive relevance of the dependent variable was assessed through the Q2 value. Any value greater than zero establishes the predictive relevance of the dependent variable.

Table 4.78 suggest that all the dependent variables have predictive relevance greater than zero, hence predictive relevance was established. Furthermore, the fitness of the model was assessed through the value of SRMR. The acceptable range for SRMR is between zero and 08. The value of SRMR is 0.07 which lies in the acceptable range. The value of the SRMR indicates model fitness.

Table 4.78

R-Square, Predictive Relevance, And Model Fitness

	R^2	Q^2	SRMR
Knowledge	0.339	0.327	
Attitude	0.390	0.381	0.07

Figure 4.2

Structural Model
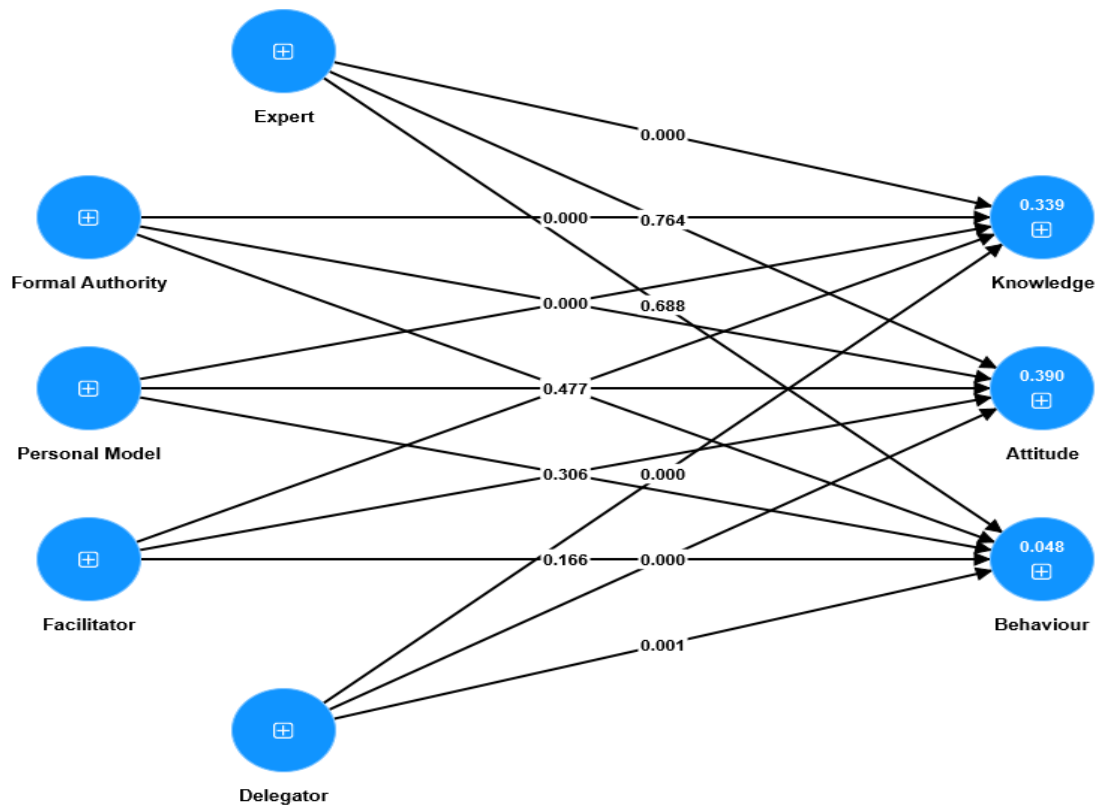
The current study aimed at assessing the teacher-educator teaching style on student-teacher SC. Specifically, the current research studies the effect of student-centered and teacher-centered teaching style with the student-teachers' knowledge attitude, and behaviors towards SD. To calculate these coefficients, SmartPLS was configured for bootstrapping with a subsample of 5,000 to compute t-values and p-values at a significance level of 0.05. (Hair et al., 2011).

Table 4.79

Path Analysis Results

	Path	β	SD	t-Values	p-Values	F-Square	Results
H_08a	Expert -> Knowledge	0.22	0.04	5.64	0.00	0.05	Null Rejected
H_08b	Expert -> Attitude	-0.01	0.04	0.30	0.76	0.00	Null Supported
H_08a	Expert -> Behavior	0.02	0.04	0.40	0.69	0.00	Null Supported
H_08d	Formal Authority -> Knowledge	0.24	0.05	4.75	0.00	0.05	Null Rejected
H_08e	Formal Authority -> Attitude	0.32	0.04	7.41	0.00	0.09	Null Rejected
H_08f	Formal Authority -> Behavior	0.03	0.05	0.71	0.47	0.00	Null Supported
H_08g	Personal Model -> Knowledge	-0.02	0.03	0.80	0.42	0.00	Null Supported
H_08h	Personal Model -> Attitude	0.05	0.03	1.57	0.12	0.00	Null Supported
H_08i	Personal Model -> Behavior	0.04	0.04	1.02	0.31	0.00	Null Supported
H_08j	Facilitator -> Knowledge	0.16	0.05	3.22	0.00	0.02	Null Rejected
H_08k	Facilitator -> Attitude	0.28	0.04	6.62	0.00	0.07	Null Rejected
H_08l	Facilitator -> Behavior	0.07	0.05	1.38	0.17	0.00	Null Supported
H_08m	Delegator -> Knowledge	0.14	0.03	4.78	0.00	0.02	Null Rejected
H_08n	Delegator -> Attitude	0.14	0.03	5.31	0.00	0.02	Null Rejected
H_08o	Delegator -> Behavior	0.15	0.04	3.46	0.00	0.01	Null Rejected

H_08a: Expert teaching style has no effect on student-teachers' Knowledge pertinent to SD.

It was hypothesized that expert teaching style have no effect on student-teachers' knowledge pertinent to SD. The results of the current study suggest that expert teaching style have a positive and statistically significant effect on student-teachers'

knowledge pertinent to SD (β = 0.22, p < 0.05). Hence, the $H_0$8a hypothesis was rejected. The findings of the current study suggest the more teacher-educator utilizes the expert teaching style; the more student-teacher knowledge pertinent to SD will increase. The results are summarized in Table 4.79

$H_0$8b: Expert teaching style has no effect on student-teachers' attitude pertinent to SD.

It was hypothesized that expert teaching style have no effect on student-teachers' attitude towards SD. The results of the current study suggest that expert teaching style have a statistically insignificant effect on student-teachers' attitude pertinent to SD (β = -0.01, p = 0.76 > 0.05). Hence, the $H_0$8b hypothesis was supported. According to the findings, expert teaching styles seem to have no effect on student-teachers' attitude toward SD. The results are summarized in Table 4.79

$H_0$8c: Expert teaching style has no effect on student-teachers' behavior towards SD.

According to the present study's findings, no statistically significant effect of expert teaching style on student-teachers' behaviors was found (β = 0.02, p = 0.67 > 0.05). Thus, the $H_0$8c hypothesis was rejected. According to the findings, expert teaching styles seem to have no effect on student-teachers' behaviors toward SD. The results are summarized in Table 4.79.

$H_0$8d: Formal Authority teaching style has no effect on student-teachers' knowledge towards SD.

It was hypothesized that formal authority teaching style has no effect on student-teachers' knowledge towards SD. The results of the current study suggest that formal authority teaching style have a positive and statistically significant effect on student-

teachers' knowledge pertinent to SD ($\beta = 0.24$, $p = 0.0005 < 0.05$). Hence, the H_08d hypothesis was rejected. The findings of the current study suggest the more teacher-educator utilizes the formal authority teaching style; the more student-teacher knowledge pertinent to SD will be. The results are summarized in Table 4.79.

H_08e: Formal Authority teaching style has no effect on student-teachers' attitude towards SD.

It was hypothesized that formal authority teaching style has no effect on student-teachers' attitude towards SD. The results of the current study suggest that formal authority teaching style have a positive and statistically significant effect on student-teachers' attitude pertinent to SD ($\beta = 0.32$, $p = 0.0005 < 0.05$). Hence, the H_08e hypothesis was rejected. The findings of the current study suggest the more teacher-educator utilizes the formal authority teaching style; the more student-teacher attitude pertinent to SD will be. The results are summarized in Table 4.79.

H_08f: Formal Authority teaching style has no effect on student-teachers' behaviors towards SD.

It was hypothesized that formal authority teaching style has no effect on student-teachers' behaviors towards SD. The finding of the current research suggest that formal authority teaching styles have statistically insignificant effect on student-teacher social knowingness ($\beta = 0.03$, $p = 0.47 > 0.05$). Hence, the H_08f hypothesis was accepted. According to the findings, formal authority teaching styles seem to have no effect on student-teachers' behaviors toward SD. The results are summarized in Table 4.71.

H_08g: Personal model teaching style has no effect on student-teachers' knowledge towards SD.

It was hypothesized that personal model teaching style has no effect on student-teachers' knowledge towards SD. The finding of the current research suggest that personal model teaching styles does not have statistically significant effect on the student-teacher knowledge pertinent to SD (β = -0.02, p = 0.42 > 0.05). Based on the results, the H08g hypothesis was accepted. According to the findings, personal model teaching style seem to have no effect on student-teachers' knowledge pertinent to SD. The results are summarized in Table 4.79.

$H_0$8h: Personal model teaching style has no effect on student-teachers' attitude towards SD.

It was hypothesized that personal model teaching style has no effect on student-teachers' attitude towards SD. The finding of the current research suggest that personal model teaching style have statistically insignificant effect on the student-teacher attitude towards sustainable development (β = 0.05, p = 0.12 > 0.05). Hence, the $H_0$8h hypothesis was accepted by the results. According to the findings, personal model teaching style seem to have no effect on student-teachers' attitude toward SD. The results are summarized in Table 4.79.

$H_0$8i: Personal model teaching style has no effect on student-teachers' behaviors towards SD.

It was hypothesized that personal model teaching style has no effect on student-teachers' behaviors towards SD. The finding of the current research suggest that personal model teaching style have statistically insignificant effect on student-teacher behaviors (β = 0.04, p = 0.31 > 0.05). Hence, the $H_0$8i hypothesis was accepted based on the results. According to the findings, personal model teaching style seem to have

no effect on student-teachers' behaviors towards SD. The results are summarized in Table 4.79.

H$_0$8j: Facilitator teaching style has no effect on student-teachers' knowledge pertinent to SD.

The finding of the current research suggest that facilitator teaching style has a positive and significant effect on the student-teacher knowledge pertinent to SD (β = 0.16, p = 0.001 < 0.05). Hence, the H$_0$8j has been rejected. The findings of the current study indicate the more teacher-educator utilizes the facilitator teaching style the more student-teacher knowledge pertinent to SD will be. The results are summarized in Table 4.79.

H$_0$8k: Facilitator teaching style has no effect on student-teachers' attitude pertinent to SD.

The finding of the current research suggest that facilitator teaching style has a positive and significant effect on student-teacher attitude towards SD (β = 0.28, p = 0.0005 < 0.05). Consequently, the H$_0$8k hypothesis was rejected. The finding of the study indicate that the more teacher-educator utilizes the facilitator teaching style the more student-teacher knowledge pertinent to SD will be. The results are summarized in Table 4.79.

H$_0$8l: Facilitator teaching style has no effect on student-teachers' behaviors pertinent to SD.

This research demonstrates that facilitator teaching style has no statistically significant effect on student-teachers' behaviors towards SD (β = 0.07, p = 0.17 > 0.05). Consequently, the H$_0$8l hypothesis was supported by the data. The results suggest that

facilitator teaching style does not affect student-teacher sustainability-related behaviors in current research. The results are summarized in Table 4.79.

$H_0$8m: Delegator teaching style has no effect on student-teachers' knowledge pertinent to SD.

It was hypothesized that Delegator teaching style has no effect on student-teachers' knowledge pertinent to SD. This research demonstrates that delegator teaching style have a positive and statistically significant effect on student-teachers' knowledge ($\beta = 0.14$, $p = 0.0005 < 0.05$). Consequently, the $H_0$8m hypothesis was rejected. The result implies that the more the teacher-educator employs the delegator teaching style, the greater the student-teachers' knowledge towards SD would be. The results are summarized in Table 4.79.

$H_0$8n: Delegator teaching style has no effect on student-teachers' attitude pertinent to SD.

It was hypothesized that delegator teaching styles has no effect on student-teachers' attitude pertinent to SD. This research demonstrates that delegator teaching style have a positive and statistically significant effect on student-teachers' attitude ($\beta = 0.14$, $p = 0.0005 < 0.001$). The findings therefore suggest that $H_0$8n was rejected. The present study's findings imply that student-teachers' attitude towards SD will increase as a consequence of the use of the delegator teaching style. The results are summarized in Table 4.79.

$H_0$8o: Delegator teaching style has no effect on student-teachers' behavior pertinent to SD.

It was hypothesized that delegator teaching styles has no effect on student-teachers' behavior pertinent to SD. The results suggest that delegator teaching style have a positive and statistically significant effect on student-teachers' behavior towards SD ($\beta = 0.15$, $p = 0.0005 < 0.001$). The findings therefore suggest that H_08o was rejected. The present study's findings imply that student-teachers' behavior towards SD will increase as a consequence of the use of this delegator teaching style. The results are summarized in Table 4.79.

H_08: Teaching styles have no effect on student-teachers' SC.

Table 4.80

Path Analysis: Teaching style -> SC

	Path	β	SD	T Values	P Values	Results
H_08	Teaching style -> SC	0.486	0.027	17.37	0.000	Null Rejected

It was hypothesized that teaching styles have no effect on student-teachers' SC. The finding of the current research suggest that teaching style have statistically significant effect on student-teacher SC ($\beta = 0.486$, $p = 0.000 > 0.05$). Hence, the *H_08* hypothesis was rejected based on the results. According to the findings, teaching style seem to have fairly significant effect on student-teachers' SC. The results are summarized in Table 4.80.

4.5 Thematic Analysis

Thematic analysis is a method used to analyze qualitative data, such as interview transcripts and notes, by identifying common themes, patterns, and concepts that emerge. The process involves thoroughly examining the data to identify these recurrent ideas and meanings. According to Clarke, Braun, and Hayfield (2015), there are six

steps involved in conducting a thematic analysis. The collected and transcribed data was analyzed using the following steps.

Step 1	Step 2
•Familiarization of data	•Initial coding

Step 3	Step 4
•Developing themes	•Reviewing themes

Step 5	Step 6
•Defining themes	•Write up
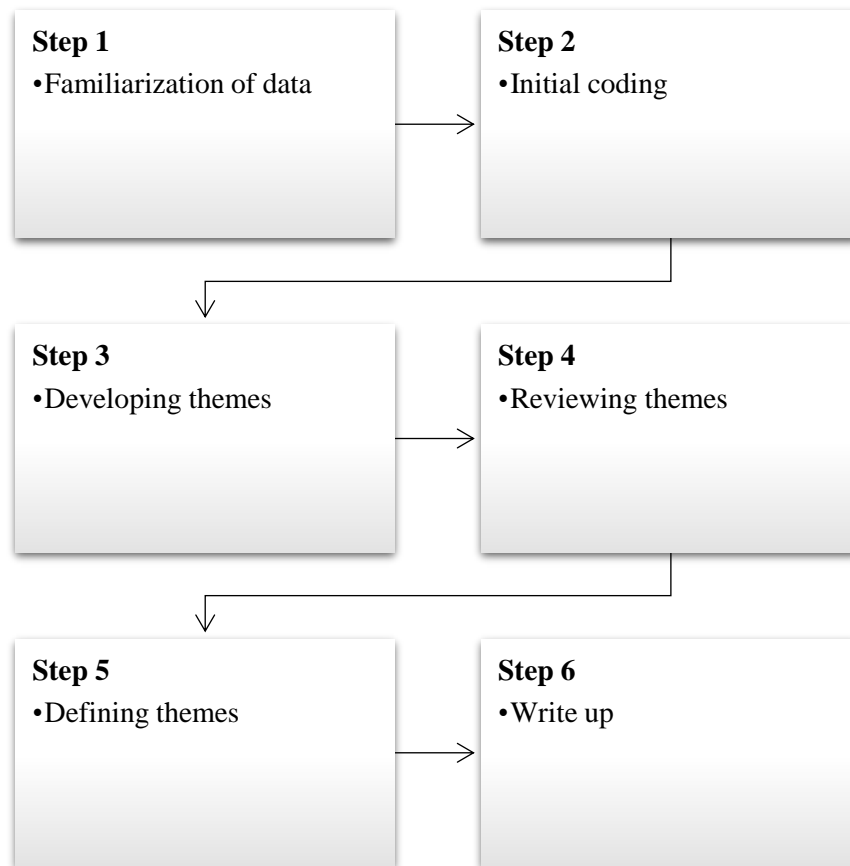
The following section contains the interview' themes; codes extracted from student-teachers' interviews and some quotes of selected interviews. Moreover, the research questions, main themes, and codes are presented in question wise coding table 4.81. Semi-structured interviews were conducted to obtain a deep insight and better idea of student-teachers' understanding of sustainability-related concepts in general and their knowledge, attitude and behavior towards the environmental, social, and economic dimensions of SD. Further, student-teachers were asked about various initiatives taken by their teacher-educator to teach sustainability-related concepts, the experiences they got, and how the various activities conducted by the subject teachers change their SC. The results of the student-teachers' interviews are discussed in the following tables and paragraphs.

Table 4.81

Themes related to Knowledge of SD

Research questions	Main themes	Codes
To what extent students have knowledge about SD.	Definition of SD	develop, developed, developing, development, education, growth, rise, underdeveloped
		sustainability, sustainable
		resource, resources
		cutting, decrease, reduce, reduces, reduction
		demands, involves, need, needs
		conserve, economic, save
		conserve, keeping, maintain, maintained, maintaining, preservation, preserve, save
	Pillars of SD	Dimension, aspects, measures
		Environmental, environment
		recycle, recycling, reusable, reuse, reusing
		social, societal
		use, using, utilization, utilize
		Future generation, generations, products

In order to assess student-teacher understanding of the sustainability concept, they were asked to define SD in their own words and according to their understanding. The knowledge about the SD was further categorized into A-priori sub themes. Student-teachers were also asked to share their understanding of the three dimensions of SD i.e., environmental, social, and environmental. Although, student-teachers have an idea of the three dimensions of SD, however, their understanding was limited regarding the three dimensions of SD.

One of the students answered that *"SD is the utilization of resources in the manner that may not have any direct / indirect harmful effect on the future generations.*

Therefore, every development is sustainable if it does not affect our ecosystem and society presently and, in the future". [Respondent-I]

Another student emphasized on the balance between various dimensions of the SD and stated that.

"The universe is working in a balance. Therefore, we need to maintain the necessary balance in all aspects of our life and avoid disturbing this balance. The balance can only be maintained by a SD. Therefore, we cannot compromise on any dimension of SD" [respondent G].

One student-teacher defined it in both individual and national level. The student-teacher defined SD as "the development in which individuals fulfill their needs keeping in view the personal and country needs for present and the future , *owing to the scarcity of the resources, we need to focus on recycling and reusing the resources*" " [respondent-A]

Another student said that SD involves *activities to save the future of generation to fulfill their needs.* [respondent M]

One student said, *"SD is built on three pillars: efficient use of resources, environmental stewardship, and effective use of human resources"* [respondent-C].

Another student quoted, "SD is all about natural resources and preservation of resources and finding solutions to the problems" [respondent-D].

Table 4.82

Themes Related to Knowledge of Three Pillars of SD

Research question	Main Themes	Codes
What is the knowledge of students' teachers about the pillars of SD?	Environmental knowledge	Preservation of natural resources, effective use of resources, use environmentally friendly products, save earth, Reduce pollution, Use of public transportation, Carefully use of natural resources
	Social knowledge	Socio- Cultural values, Human rights, poverty reduction, responsible citizen, Healthy lifestyle, Promote peace, Gender equality, Equity and justice, Harmony among cultures
	Economic knowledge	Economic development, Increase the Use local Products, Focus on Import export, Reduce Poverty, Construction of Local Areas industries, Proper Planning, Provide job opportunities, Community development

Environmental knowledge

Most of the student-teachers have the knowledge of environmental issues. Students mostly responded that one of main problem of environmental protection is pollution. Moreover, they explained that the increase rate of CO_2 use of plastic bags, frequently cutting trees are some common causes of pollution.

For example, one of the students responded to that.

Environmental component includes deterioration of environment, rise of pollution, and increase of CO_2 and other greenhouse gases in the environment. Industry

releases smoke and waste into the air and water, which have a negative impact on the environment. Heavy traffic on the roads, in addition to industrial waste, may pollute the air [respondent I]

Similarly, another student-teacher shared that.

Environmental dimension includes safeguarding of natural resources including water supply, forests, and maintaining earth's physical qualities. [respondent F]

Another student mentioned initiatives at a personal level.

Some simply associated the concept of SD to the reuse and recycling. For example, one student-teacher commented "[SD is] *Reduce, recycle, reuse the resources, and preserve resources for the future generations as well. Plastic bags hurt the ecology; Cutting trees reduces oxygen and raises CO_2 level. Reusing resources may benefit our economy.* [respondent B]

<u>Societal knowledge</u>

Another student commented that,

Social dimension includes interpersonal and intrapersonal relationships, relationships with other nations, and managing diversity [respondent-A].

"*Social dimension implies relationships between people, empathy and respect for other people opinions, culture, and religion.* [respondent B]

I am aware that the aims of SD are to alleviate poverty, quality education, environmental preservation, gender equality, and to provide the fundamental needs and rights to the people" [respondent-F]

The social dimension includes preservation of cultural and providing quality education" [respondent-J]

Knowledge of Economic dimension

For example, a student elaborated that *Economic dimension comprises imports and exports, per capita income, GDP etc."* [respondent-F]

Another student further enhanced the discussion on the SD and suggested strategy for environmental, economic, and social sustainability: -

Focusing on less developed / rural areas will reduce urbanization and will provide economic opportunities to people which ultimately affect their social development. Moreover, cutting down trees affects ozone and climatic temperature. We don't plan for long-term development, rather focusing on short term goals and objectives without considering the environmental, social, and economic consequence [respondent J]

Figure 4.3

World Cloud About the Pillars of SD

Table 4.83

Themes Related to Attitude of Student-Teachers Towards SD

Research questions	Themes	Codes
What is the of student-teachers Attitude towards SD?	• Attitude towards environment	Reducing Industrial waste, improving traffic system, using of public transport, Recycling, Avoid to Utilizing Coal and gas resources, utilize solar panels, reducing the amount of water we waste, planting tree, using reusable bags, Through Avoid use of plastic, carefully using papers and stationary items, Preservation of natural resources, educating people, Preventing pollution, Manufacturing environmentally friendly items
	Attitude towards society	lack of education and awareness**,** budget for education is very low**,** based on education we can reduce the problem of poverty and unemployment**,** less aware of others' rights. Females' education**,** good planning and population management are required**,** Respect for gender equality**,** religious harmony**,** peace, harmony, and respect

Most of the student-teachers recommended environmental initiatives, a very few discussed sustainability from social and economic perspectives.

Environmental initiatives

For example, a student mentioned environmental initiatives that can be taken on the individual level: -

Industry releases smoke and waste into the air and water, which have a negative impact on the environment. Heavy traffic on the roads, in addition to industrial waste, may pollute the air. In order to attract more individuals to use public transportation instead of their own vehicles, the public transportation system has to be improved and enhanced. New methods of tree cultivation, particularly in urban settings, are urgently required [respondent-k].

Another student-teacher commented on the question related to saving environment, economy, and society for the future generations; -

Recycling is an effective method for conserving resources and ensuring their long-term viability while also promoting SD. For example, we generate power utilizing hydro and coal/gas resources. Every year, a significant amount of natural water is squandered. A better alternative to coal and gas is to utilize solar panels to generate electricity. As a result, we can safeguard both our water supply and the natural environment. Education is important element for promoting development. Teachers and individuals alike may play an important role in raising awareness about SD among the public. hence, we should use reusable or homemade bags. [respondent M].

"We can do our part to protect the environment by reducing the amount of water we waste, waste we generate, and the amount of power we use. Our people's health and the prosperity of our society will be guaranteed if we protect our environment. [respondent L].

Another student-teacher emphasized on the importance of small steps for a better future. The student-teacher stated that "*Small efforts may have a big impact, such as planting more trees and using reusable bags instead of plastic, which can help decrease pollution to some degree*" [respondent-B].

We should maintain a responsible environmental interaction, avoiding environmental deterioration, depleting resources, and deforestation, and building industries in less developed regions to conserve the environment. [respondent C]

Other student-teachers emphasized on the utilization of renewable energy technique for power generation which protects environment as well have economic benefit as well. Another student-teacher stated that,

"The depletion of our planet's water and other resources is a result of people's reckless use of these resources. Moreover, we can contribute to environmental protection by carefully using papers and stationary items. [respondent E].

Moreover, the student-teacher stated that "*the preservation of the natural environment necessitates educating people about environmental protection, preventing pollution, and using environmentally friendly materials. As a result of using locally created environmentally friendly items, both the environment and economy will benefit*". [respondent C]

Attitude towards society

Another student added regarding the role of education and gender disparity; -

The main issue of society is lack of education and awareness, Pakistan is a developing country where the allocation of budget for education is very low,

based on education we can reduce the problem of poverty and unemployment. Women's and transgender rights are two of the most important social concerns of our time. At large we are less aware of others' rights. Females' education is as important as those of men as they have the ability to change generations" [respondent-F].

Similarly, population explosion is one of the concerns being faced by many developing and underdeveloped countries as one student-teacher rightly mentioned,

"*For the preservation of the ecosystem, good planning and population management are required. When we control the population, we will be able to manage our resources accordingly*". Another student stated, *Respect for gender equality, cultural diversity, and religious harmony should be regarded for the evolution of society"* [respondent-A].

Moreover, one student emphasizes on the knowledge sharing pertinent to SD with all people. Student-teacher also provided their opinion on the ways the world can be made more sustainable. Each student-teacher has his/her own understanding and opinion regarding the asked question. For example, one student-teacher stated that: -

"Peace is essential for long-term growth. The world will not be able to progress in a sustainable manner without peace. We can observe the effects of the conflict between Russia and Ukraine. Inflation, energy costs, and political inequity are rising. In the blink of an eye, a battle between two nations may engulf the whole globe. [respondent I]"

Similarly, another student also supported the same point and stated that, "peace is necessary, without peace no development is possible. Billions of dollars are being

invested on weapons which can otherwise be used for the betterment of people. [respondent K]"

Another student commented that, "disputes should be settled among the nations. All the parties need to perform their role. Government is responsible for broad scale initiatives while individual duty is to engage in individual level acts that will make the world a better place". An educational and training program should include a long-term strategy to incorporate SD into the curriculum and encourage instructors and students to adopt the practices in their everyday lives.

Despite this, long-term problems like decreasing water levels and flooding still exist. But now that I've given it some thought, the nonchalant attitude of the people toward environmental destruction and other social and economic injustices makes me sick to my stomach. We must alter our way of life[respondent-A.

Donations may assist us enhance society's demands; we should reduce water and food waste, particularly at homes and restaurants[respondent-B].

<u>Attitude towards economy</u>

Another student-teacher was of the view that; -

For economic growth, income and spending should be monitored and a balance needs to maintain between income and spending. All members of the community should be encouraged to use their resources wisely. We should live a healthy and stable life with given resources and avoid fallacy to enhance living standards by enhancing spending. Public transport also requires governmental attention to facilitate mass population and mainly middle class and below population. A culture of peace, harmony, and respect needs to be

promoted. Collective interest should be put prior to the personal interests. Growth requires positive dependency. [respondent F].

Another student further added the importance of small and medium businesses development for a SD. The student-teacher stated that.

"*government should facilitate small and medium size businesses to fostered for economic development, and individuals may establish new businesses locally. This will help in overall economic development and raise in social standard* [respondent A]

Another student-teacher added,

Another student added "*Pakistan is a developing country with a low budget allocation for education. By increasing educational attainment, we can lessen the prevalence of poverty and unemployment t*[respondent J].

One student mentioned the corruption and role of education in reducing corruption. The student-teacher stated, *"The economy may be benefited by decreasing corruption, and education can play a significant role in altering individual attitudes*". Another student-teacher pointed out to the importance of skills development for economic and social development by stating that "*All people must be made aware of the necessity to acquire a variety of skills in order to achieve financial independence, which will eventually effect the economy as a whole"*. Some other mentioned the use of technology instead of the paper. Another student mentioned the lack of planning in all the field. *SD cannot be achieved without proper planning and dedication. People needs to understand the importance of sustainability in every field mainly in construction and production.* [respondent B].

Some student-teacher pointed towards the collaboration among the public and private sector. For example, a student stated that, *public-private partnerships are essential for economic progress, but private sector investment in Pakistan is outpacing public-sector investment because of a resources scarcity and lack of innovation in public sector.* [respondent L]

Another student-teacher opined that.

"*We need to use to locally grown / manufacture things to reduce the imports. Using local products will help developing local industries, reduce poverty, mastery in the products, and raise in social standards. Moreover, this can result in an increase our exports leading to decrease import-export gap. We being an underdeveloped country certainly need to reduce this gap to achieve economic and societal sustainability.* [respondent J]

Figure 4.4

World Cloud About Student-teachers Attitude Towards SD

Table 4.84

Themes Related to Student-Teachers' Behavior Towards SD

Research question	Themes	Codes
What is the Behavior of student-teachers towards SD?	Behavior towards environment	avoid use of plastic bags
		Try to recycle
		Grow plants
		Give awareness of pollution
		Use public transport
		Save water
		Off extra lights
		Work in group
	Behavior towards society	Donations during covid-19
		Educate street children
		Respect others
		Help poor
		Value opinions of others
	Behavior towards economy	Freelancing for support

Several students said that they had taken part in a campaign to preserve water, which aims to raise public awareness about the need of conserving water. They placed a Pana flex that displayed graphics related to water conservation. Most of the student mentioned that they contributed towards SD through tree plantation, use of bio-degradable shopping bags, by gaining some financial independence through freelancing, home grown gardening, by showing respect for others culture and religion, and by following the law.

Environmental behavior

Most of the student-teachers stated that they have been involved in home growing plants for the betterment of environment.

For example, a student-teacher stated that "*I grow plants, take care that no one gets hurt because of me*". [Student-B]

Similarly, another student suggested, "*For environmental reasons, I plant at least two to three trees a year.* [Student-C]

Another student-teacher stated, "*We cleaned up the trash around the Faisal Mosque. Further, Various plants are grown at different universities with the help of students*". [Student-E]

Some student-teachers started to avoid plastic shopping bags and started to use bio-degradable and cloth bags for shopping. For example, a student-teacher stated that, "*The government's prohibition on plastic bags prompted me to make my own bag, which I used instead of plastic bags when I went for shopping.* [Student-M]

One of the student-teachers claimed that *he makes efforts to encourage people to adopt 3R concept i.e., reduce, recycle, and reuse. We must also repair old made automobiles that pollute the air".* [Student-l]

Behavior towards society

Some others mention community work as a part of their undergraduate project. For example, a student stated that, "*We conducted a four-week project related to community services in which we provided awareness related to various environmental and social issues*" [respondent-F].

In order to promote cultural diversity and harmony at the same time, educational institutions seldom arrange events.

Some student-teacher mentioned voluntarily initiatives for helping the needy students. For example, a student-teacher stated that "*we collected donations in order to pay student fee*" [respondent-A].

Economic behavior

Most of the students failed to mention any economic contribution they made. However, some mentioned freelancing as an economic activity for SD.

For example, a student-teacher stated that "*I am supporting my family economically through freelancing. In some ways, my freelancing helps alleviate some of the financial stress on my parents*" [respondent-K].

As discussed previously, most of the student-teachers' activities are related to environmental and social dimension, while the economic dimension has been missing in the student-teacher responses.

Figure 4.5

World Clouds About Sustainability Behavior

Table 4.85

Themes Related to Teaching Styles

Research question	Themes	Codes
What are the Teaching styles of teachers' educators to teach the concepts of SD?	Teacher centered	assignment, assignments, demonstrating, present, presentation, presentations, submit, chart, example, examples, models
		Lectures, transferring, deliver, textbook reading, reading, readings, understanding
		Quizzes
	Students centered	answer, respondent, response, result, serve, solution, Dialogue, discussions
		community, donation activity
		images, projects, chart, created, see, visit, trip
		Article, Case study
		Brainstorming, think, thinking, remember
		Seminars, workshops

These following paragraphs will explain the student-teachers perception of their teacher-educator teaching style while teaching sustainability related concepts. Student-teachers were asked to share their experience while teacher-educator teaches concepts/themes related to SD. Most of the students mentioned lectures, quizzes, assignments, while other notable activities/methods include field visit, article readings, presentations, classroom discussions, 3R activities, workshops, seminars, and so on so forth. A few glimpses of the student-teachers' response is given below.

Teacher centered teaching style.

A student-teacher mentioned that "*I can say, our teacher utilizes traditional teaching methods like lectures, assignments, and quizzes almost all the time teaching and assessment. I could not remember if there was any other method used during the*

whole semester. However, very few teachers used discussion and presentations methods during the class A student also identified the same issue and stated that "We didn't become involved in any economic development activities; instead, we focused on environmental and social issues" [respondent-A].

Further, another student-teacher said that the lectures were quite typical and lectures were mostly unexciting by stating that *"we used to take three or four classes each day. Every teacher comes and deliver lectures, take quizzes and days have been passed. Since my childhood, I felt, we are trained to memorize rather than learning something and this process goes on"* [respondent-M].

Most student-teachers rated their instructors as teacher-centered because they concentrate on transferring knowledge and student-teachers are expected to learn and preserve it. For example, a student-teacher stated that *"I found the education as a subject and our teacher-educators as very dry and boring. My feeling is based on their teaching style; nothing new and innovative, no student involvement, assignments are boring and fatigue. We are considered as empty vessels that needs to be filled. I also found teacher-educators reluctant to use technology and innovative approaches in their teachings.* [respondent C].

Student centered teaching style

One student mentioned brainstorming activity and found it useful in developing their understanding of the subject. The respondent stated, "*I liked how the instructor emphasized thinking over memorizing. It's hard to grasp how a third-year subject links into everyday life, but I liked that the instructor helped us think that way. I liked that the textbook wasn't the focus of the course; the teacher contributed much more*" [respondent D].

On the other hand, some student-teachers mentioned student-centered activities during their course work. For example, one student mentioned that.

"*We were asked to showcase cultural diversity in Pakistan while studying the school, community, and teacher subject. Every student was expected to present others culture using their dressing, music, houses, etc. Although, this was a small activity, however, this gave us a fair idea of other cultures in Pakistan"* [respondent F].

One student-teacher mentioned that "*Our instructor took us on a field trip to an industrial waste firm and intercity transport offices in order for us to comprehend their impact on the environment* [respondent-C].

Some other student-teacher mentioned about *their visit to the zoo to give them an idea about various animals, their habitats, and relationship with their environment* [respondent-L].

Another student-teacher stated that their teacher-educator used to give article reading assignments to the student-teachers.

For example, on student stated that "*our teacher provides us with the report on UN Vision of 2030 and gave us assignment to assess the Pakistan position in regard to the UN 2030 vision"*.

Another student-teacher stated that "*however, despite our teacher's efforts to educate us about SD, I still believe that the existing curriculum is not sufficient"*. Some students have reported that they have provided food and clothing to those in need during the Ramadan.

Student-teacher were asked to provide a few examples of activities they had carried out during the classroom, which contributed their knowledge, attitude, and behavior towards SD.

A student mentioned that "we created several traffic pollutions chart, demonstrating how vehicle smoke may cause skin and lung ailments. Another student-teacher mentioned that "*The teacher-educator assigned us the assignments related to sustainability issues. We were asked to develop assignments on our themes and present them in the class. The presentation was then followed by a discussion on the issue at hand*" [respondent-D].

Moreover, another student-teacher stated that, *in art and craft class, we were asked to bring unused materials and reuse it to create something new*[respondent-A].

We created images of animals and fish to highlight how water pollution can impact our biodiversity". [Student-H]

Similarly, another student added, "There was a teaching practicum recently in which we focused on how we can provide children with quality education and how teachers may serve as role models. Furthermore, in environmental education subject, we conducted activity of planting trees". [Student-k]

Figure 4.6

World Clouds About Different Classroom Activities

The following paragraphs provides a brief overview of the student-teacher responses regarding the association between teacher-educator teaching style and student-teachers' SC. Student-teacher were asked if their teachers teaching styles have any effect on their knowledge, attitude, and behavior pertinent to SD. Most of the student-teachers agreed to the fact that their teacher teaching style have a positive effect on their knowledge, attitude, and behavior. Most of the student-teachers mentioned that their teacher utilized traditional teaching methods like lectures, assignments, and quizzes for teaching sustainability related concepts. However, student-teachers' found these methods useful for enhancing their knowledge and understanding, however, they were dubious about their long-term effectiveness.

Table 4.86

Themes Related to Effect of Teaching Styles on SC

Research questions	Themes	Codes
How Teaching styles are responsible for Change in SC?	Change in knowledge Change in attitude. Change in behavior.	Enhance my knowledge I am concerned to realized Change in my feeling help to learn something new modify my behavior changing my attitude Teaching practice Reading Course assignment Teacher behavior
	Student centered.	Through discussion due to visit orphan home
	Teacher centered.	Questions and answers through lectures

For example, a student-teacher stated that.

"Our teacher utilized mainly lecture method. I am not going to deny that lecture method was useful in enhancing our knowledge and understanding. However, what I felt, this knowledge is temporary and most of us are not going to use it anywhere". [respondent B]

Similarly, some student-teachers also endorsed the above statement by stating that "we memorized the content for passing the exams. The process is pretty standard all over; teacher will come, deliver the lecture, give students notes, student will memorize, and will complete the course. This process is suitable for manufacturing, but not for producing system thinkers. I don't think these methods hardly changed my attitude and behavior". [respondent H]

Another student-teacher stated that, "if you ask me, I act sustainably, my answer will be no. I may have some knowledge, but I am unable to associate this knowledge to my real life. I think we being future teachers need a lot of improvement in our pedagogical (teaching) styles" [respondent E]

Another Student stated that, "these classes, despite their educational value, didn't modify my attitude or behavior. Teacher-educators mostly used the lecture style, which I believe is inappropriate for teaching such a subject" [respondent-K]

Student-teacher were asked about whether the classroom activities were helpful in learning more about sustainability. Most of the student-teacher stated that classroom activities were helpful in learning more about the sustainability related concepts.

On the contrary a student-teacher stated that "The only means of instruction we had were lectures and handouts, neither of which I found very useful for learning about sustainability" [respondent-D]

"Yes, lately we had a teaching practice in school where we focused on how we can provide our children quality education and how a teacher can serve as a role model for their pupils. I came to know that teachers are role model for every child, and we can make a big difference by guiding children in the right direction" [respondent-C]

On the other hand, student-teachers found student-centered teaching approaches useful in developing their knowledge, attitude, and behavior. For example, a student-teacher opined that, "sustainability cannot be taught, it is a mindset which requires students' exposure to real life issues". The point was also supported by another student-teacher stating that, "We always heard about poverty, social justice, and equality but we did not feel them before visiting orphanage and conducting a research project on social issues around us. In this exercise, everyone has to share their experiences in the classroom. I think, the books may not have been taught us the way that one experience taught us" [respondent-J]

Reading was quite beneficial. It inspired me to study more about SD and the environment. The notion of SD was unknown to us, and readings enabled us to learn about it. [respondent L]

The course assignments were beneficial in increasing our understanding of sustainability by delving deeply into the problems give a wealth of fresh information Looking at local concerns, we began to preserve water and power, to plant trees, to limit plastic shopper usage and exchange it with reusable cloth bags, to reuse plastic water bottles, and so on.   [respondent F]

The teacher was determined to have us learn something new. She was quite helpful throughout. She posed questions to elicit our responses. She did not

immediately respond to our inquiries. Instead, she posed additional questions to assist us in determining the solution. [respondent A]

The teacher's personal behavior was a great source of inspiration. She never requested that we submit our work on paper. She made us reuse paper and other materials. She enlisted the help of a group to decorate the hallway using recyclable items. By observing the teacher, I learned how to care for resources. [respondent G]

One of the student-teacher responded that

As a consequence of classroom conversations, I have developed a strong affinity for working women and female undergraduates. I am concerned to realize how many individuals do not have access to safe drinking water. I have begun to conserve energy. I [as a prospective teacher] have decided to conduct various programs in schools to raise children's awareness of current concerns. [respondent B]

Sources of knowledge

Student-teachers were asked about if they have any idea about the term "SD". Almost all the student-teachers interviewed said they have a good idea of the term SD. Moreover, most of the student-teachers learned about SD during the time in their respective educational institutions.

Most of the student-teachers mentioned the courses including environmental education, contemporary trends and issues in education, school community and teachers, teaching of social studies, and human resource development. A student responded to that. I came to about SD in the subject of contemporary issues and trends in education, but still, I am not completely sure and clear about SD. [respondent-B]. Similarly, Another student stated that "I came to know about SD in our 5th semester

when we studied the subject contemporary trends and issues in education. [respondent F]

One of the students responded to that.

In teaching of social study, we learn about our natural resource for example water, fuel, stones, salt, metals and how these material and resources are using for economy in Pakistan in different forms .We also learn about geography of Pakistan, different seasons of Pakistan, environment, and climate. We also learnt about our economy, imports, exports, and how we are developing our economy through utilizing our resources. [respondent A]

Respondent [H] responded that before studying the subject contemporary trends and issues ,I was unaware of how industries were contaminating the environment. I now know that we can affect the level of production by using less paper, plastic, and other materials. This might ease the environmental burden. [respondent G]

Figure 4.7

Word Cloud of Responses About Source of Knowledge

Some student-teachers mentioned that their research methodology teachers also introduced them with the concept of SD. Further, a student-teacher mentioned that her teacher conducted research on SD and her frequently discusses / share knowledge pertinent to SD.

Through discussion in our lecture, I came to know about SD in our course human development. [respondent F]

I came to know about SD by my supervisor as also conduct her thesis on the topic SD. [respondent G]

Moreover, other student-teachers mentioned undergraduate research work and community service activities as source of knowledge pertinent to the concept of SD.

I came to know about SD in 2nd semester when university had organized community service activities [respondent I]

Although most of the student-teachers have an idea of SD, however, most of the student-teachers were of the view that they did not study SD as whole rather they were taught about the various themes of the SD.

One student-teacher stated that, "yes, we learned many things from these courses regarding the environment and social issues. These courses offer a variety of knowledge and develop a mindset of the students". [Student-B]

on the contrary, a few other students stated that these courses have changes their attitude and behavior such as a student-teacher stated that "when you started to think about these [sustainability] issues, you started to look at both micro and macro level. You started to analyze your smallest and biggest actions. At least, I started to budge about things that did not ever bother me" [respondent-L]

"There is a decent lot of information in these courses, but I don't think this knowledge has a lasting influence on our attitudes. In most cases, students take these courses to fulfil their degree requirements rather than to put them into practice" [respondent-I]

Relationship between economic development, sustainable society, and environment

Student-teachers were asked whether there is any relationship between the three pillars/ dimensions of SD. The question was posed in order to assess their understanding of interdependence among the three pillars of SD. Most of the student-teachers have a clear idea of the interdependence. For example, a student-teacher stated that: -

"It's true that the three pillars are all interdependent. For example, if we can repurpose industrial trash or plastic garbage into new goods, we can help the economy while also protecting the environment. A lack of adequate garbage recycling will have a negative impact on the environment. On the other side, an improved economy will move us toward a more sustainable society, since a stable economy helps people meet their fundamental needs and raise their social standards" respondent-M]

Another student commented on the interdependence of the three pillars as follows: -Even though it's not an easy notion to grasp at first, understanding the interconnection of the three pillars of SD is essential. In nations such as Switzerland, the emphasis on environmental sustainability led to economic and social growth because of their efforts. As a result, we may accomplish more by concentrating on one issue, but ignoring one might have a negative impact on the other. Another, student-teacher emphasized the role of education for a sustainable future by stating that "*only*

literate people can have a good and lasting effect on the present and future of our

world." [respondent K]

Figure 4.8.

World Clouds About the Relationship Between Three Pillars of SD

4.6 Integration of Quantitative and Qualitative Results

The study utilized both quantitative and qualitative data to examine teaching styles and their impact on student-teachers' knowledge, attitude, and behavior towards sustainable development (SD). The quantitative data comprised eight null hypotheses and their sub-hypotheses, while the qualitative data was based on three research questions.

Quantitative results indicated that teacher-educators predominantly employed the expert teaching style, followed by formal authority, facilitator, personal model, and delegator teaching styles. On the other hand, the qualitative findings identified two primary teaching styles utilized by teacher-educators: teacher-centered and student-centered teaching styles. Teacher-centered methods included lectures, assignments,

quizzes, and textbook reading, while student-centered methods involved activities such as discussions, presentations, field visits, article readings, and classroom projects.

Student-teachers generally perceived their teacher-educators' teaching styles as teacher-centered, expressing that traditional methods like lectures, assignments, and quizzes were commonly used. However, some students felt these methods were unexciting and focused on memorization rather than fostering real learning. They expressed a desire for more innovative approaches and technology integration in teaching.

In addition to lecture-based teaching, teacher-educators incorporated activity-based learning, field trips, projects, collaborative teaching, community services, and discussions in their instructional methods. The study also revealed that project-based activities related to sustainability positively influenced student-teachers' behavior towards SD. Furthermore, class discussions regarding sustainability issues were reported to impact student-teachers' attitudes towards SD. Teacher lectures and classroom readings were deemed helpful in facilitating students' learning about SD.

The quantitative findings indicated that student-teachers possessed an overall below-average sustainability consciousness. Moreover, they displayed average sustainability knowledge and attitude but below-average behavior towards sustainable development. Semi-structured interviews were conducted to explore student-teachers' knowledge, attitude, and behavior towards SD. These interviews revealed that students had a general understanding of the three pillars of sustainable development: environmental, social, and economic dimensions. Their knowledge on SD was primarily acquired through courses such as environmental education, contemporary trends and issues in education, school community and teachers, teaching of social studies, and human resource development. Additional sources of knowledge mentioned

included research methodology courses, discussions with teachers, undergraduate research work, and community service activities.

While student-teachers demonstrated fair knowledge about the environmental dimension, they lacked a comprehensive understanding of the economic dimension. They recognized the social dimension of SD as encompassing a peaceful society where everyone has access to resources for a healthy lifestyle, respects cultural norms, and values gender equality, equity, and justice. Both qualitative and quantitative findings emphasized the importance of environmentally friendly practices such as reducing industrial waste, conserving water, and promoting sustainable transportation. Education was identified as a crucial factor in promoting sustainable development and contributing to societal progress. Student-teachers acknowledged the interconnectedness among the three pillars of sustainable development, understanding that actions in one pillar can affect the others. For instance, repurposing industrial waste or plastic garbage could benefit both the economy and the environment.

Path analysis revealed that expert teaching style positively influenced knowledge, while formal authority teaching style had a positive effect on both knowledge and attitude. Personal model teaching style showed no significant effect, and facilitator teaching style had a significant effect on knowledge and attitude but not on behavior. Delegator teaching style had a positive effect on all three dimensions of sustainable consciousness.

In summary, the integration of quantitative and qualitative findings demonstrated that expert teaching style positively influenced knowledge, while formal authority teaching style had a positive impact on both knowledge and attitude. The study recommended the use of project-based activities and class discussions to promote positive changes in student-teachers' behavior and attitudes towards SD. It emphasized

the significance of education as a fundamental pillar of sustainable development, suggesting the allocation of more resources to this area. While traditional teaching methods were acknowledged for their impact on students' knowledge and understanding, student-centered activities like discussions, field trips, and hands-on projects were considered more effective in shaping attitudes and behaviors related to sustainable development. Various classroom activities were found helpful in facilitating students' learning about sustainability, including creating charts and images, conducting research projects, participating in cultural diversity showcases, visiting orphanages and environmental sites, engaging in discussions and question-answer sessions, and conducting teaching practicums. Additionally, reading assignments and teacher behavior were cited as beneficial factors in promoting learning about sustainability.

4.7   Summary of the Data Analysis

Table 4.87

Summary Of the Data Analysis

Research Objectives	Research hypotheses / questions	Statistical Techniques	Results	
Objective 1 To investigate the perception of Students teachers about their teacher- educator teaching styles.	**Q1**: What are the teaching styles adopted by the instructors while educating student-teachers for SD?	Descriptive Mean	Teaching styles Expert	Mean scores 4.17
			Formal authority	3.49
			Personal model	3.41
			Facilitator	3.47
			Delegator	2.53
Objective 2 To explore the student-teachers' sustainability consciousness.	**Q2:** What is the student' teachers' knowledge, attitude, and behavior towards SD.	Descriptive Mean	Environmental knowledge	3.45
			Societal knowledge	3.93
			Economic knowledge	3.00
			sustainability knowledge	3.47
			Environmental attitude	3.66
			Societal attitude	3.61
			Economic attitude	3.64
			sustainability attitude	3.64
			Environmental behavior	2.73
			Societal behavior	3.11
			Economic behavior	3.01
			sustainability behavior	2.95
Objective 3a To examine the perception of	**H$_o$1**	H$_0$1a H$_0$1b	Independent sample t-test	Failed to reject H$_0$1a Failed to reject H$_0$1b

Student-teachers about their teacher-educator teaching styles based on gender		H_01c		Failed to reject H_01c
		H_01d		Failed to reject H_01d
		H_01e		Failed to reject H_01e
Objective 3b To examine the perception of Student-teachers about their teacher-educator teaching styles based on their age	**H_o2**	H_02a	One way-ANOVA	Failed to reject H_02a
		H_02b		Reject H_02b
		H_02c		Reject H_02c
		H_02d		Reject H_02d
		H_02e		Reject H_02e
Objective 4a To investigate the difference between the SC of students based on their gender.	**H_o3**	H_03a	Independent Sample T-test	Rejected H_03a
		H_03b		Rejected H_03b
		H_03c		Failed to Reject H_03c
		H_03d		Rejected H_03d
		H_03e		Failed to Reject H_03e
		H_03f		Failed to Reject H_03f
		H_03g		Rejected H_03g
		H_03h		Rejected H_03h
		H_03i		Reject H_03i
Objective 4b To investigate the difference between the SC of students based on their age.	**H_o4**	H_04a	One way-ANOVA	Rejected H_04a
		H_04b		Rejected H_04b
		H_04c		Failed to Reject H_04c
		H_04d		Rejected H_04d
		H_04e		Rejected H_04e
		H_04f		Rejected H_04f
		H_04g		Failed to Reject H_04g

		H_04h		Failed to Reject H_04h
		H_04i		Failed to Reject H_04i
Objective 4c To investigate the difference between the SC of students based on institutions enrolled in.	H_05	H_05a	One way-ANOVA	Failed to Reject H_05a
		H_05b		Failed to Reject H_05b
		H_05c		Failed to Reject H_05c
		H_05d		Failed to Reject H_05d
		H_05e		Failed to Reject H_05e
		H_05f		Failed to Reject H_05f
		H_05g		Failed to Reject H_05g
		H_05h		Failed to Reject $H_0 5h$
		H_05i		Failed to Reject H_05i
Objective 4d To investigate the difference between the SC of students based on education programs.	H_06	H_06a	One way-ANOVA	Failed to Reject H_06a
		H_06b		Reject H_06b
		H_06c		Failed to Reject H_06c
		H_06d		Failed to Reject H_06d
		H_06e		Reject H_06e
		H_06f		Failed to Reject H_06f
		H_06g		Failed to Reject H_06g
		H_06h		Failed to Reject $H_0 6h$
		H_06i		Failed to Reject H_06i
Objective 4e To investigate the difference between the SC of	H_07	H_07a	One way-ANOVA	Failed to Reject H_07a
		H_07b		Failed to Reject H_07b

students based on academic year.		H_07c		Failed to Reject H_07c
		H_07d		Failed to Reject H_07d
		H_07e		Failed to Reject H_07e
		H_07f		Failed to Reject H_07f
		H_07g		Failed to Reject H_07g
		H_07h		Failed to Reject $H_0\,7h$
		H_07i		Failed to Reject H_07i
Objective 5 To investigate the effect of teacher-educators' teaching style on student-teachers' SC.	**Q3:** What is the role of teaching style in developing students' SC while educating them for SD? **H_08**	H_08a	Structural equation modeling and Thematic analysis	Null Rejected
		H_08b		Null Supported
		H_08c		Null Supported
		H_08d		Null Rejected
		H_08e		Null Rejected
		H_08f		Null Supported
		H_08g		Null Supported
		H_08h		Null Supported
		H_08i		Null Supported
		H_08j		Null Rejected
		H_08k		Null Rejected
		H_08l		Null Accepted
		H_08m		Null Rejected
		H_08n		Null Rejected
		H_08o		Null Rejected

CHAPTER 5

SUMMARY, DISCUSSION, FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The research study was conducted to assess the integration of sustainable development concepts in teacher education programs and to what extent the students have the knowledge, attitude and behavior towards SD. The objectives of the current study were to explore the teacher-educators' teaching styles while educating student-teachers for SD, student-teachers' SC, effectiveness of teaching styles on students' SC, and to investigate any differences in perceived teaching styles and SC of student-teachers based on gender, age, academic program, academic years, and institutions.

Teaching styles, which are sometimes known as teaching approaches, are used by educators to influence students' thoughts, practices, and behaviors with the goal of enhancing student learning. Examples of teachers' various teaching styles include the ways in which they interact with and manage their students' learning, lead their students' work-in-progress, and creatively involve students in their respective classes. The perception or comprehension of the phenomena associated with sustainability is referred to as SC. These comprise ideas, emotions, and actions, as well as experiences and impressions that are commonly associated with oneself. Research was conducted using a methodology that used convergent, parallel, and mixed methods approaches.

A total of 1986 student-teachers from the Rawalpindi and Islamabad area who were enrolled in seven different public sector institutions made up the study's population. All the individuals who were chosen were enrolled in one of three different undergraduate

programs i.e., BS Education, B.Ed. Secondary, and B.Ed Elementary. This study's sample was selected using a stratified random sampling strategy. A total of 993 students, or which are 50% of the sample, were chosen randomly from the whole population of 1986 student-teachers. In current research, two standardized research tools were adapted for data collection, a standardized questionnaire namely the Teaching Styles Inventory: Version 3.0 developed by Grasha (1996) was adapted to assess the teacher-educators teaching styles in student-teachers perspective. Grasha (1996) measured five teaching styles i.e., 1) Expert, 2) Formal Authority, 3) Personal Model, 4) Facilitator, and 5) Delegator. Furthermore, the Gericke et al. (2019) questionnaire namely the Sustainability Consciousness Questionnaire (SCQ) was also adapted to assess student-teachers' SC. The SCQ-L was developed to measure students' knowingness, attitude, and behavior towards three pillars of SD i.e., environment, social and economic dimensions. The SCQ-L have three dimensions i.e., sustainability knowingness, sustainability attitude, and sustainability behavior.

The researcher utilized a mix-method approach for data collection for collecting of the data. The quantitative data was collected using a research questionnaire, while for qualitative data semi-structured interviews were conducted. Descriptive, t-test, ANOVA, and Structural Equation Modelling were among the statistical techniques used for the data analysis. These statistical tests were performed using the statistical tools SPSS 25 and Smart PLS. Based on the results of the current study, the findings, discussions, conclusion, recommendations, and suggestions for future research are provided in the following the following section.

5.2   Findings

Results acquired after statistically processing the data formed the basis of the study's findings. The study's findings were founded on research objectives and research hypotheses. Following are the findings of the current study.

Section I: Descriptive Statistics

1.   The survey respondents comprise 568 (75.4%) female and 185 (24.6%) males.

2.   Respondents age between 19 – 21 years (n = 187, 24.8%), 22- 24 years (n = 193, 25.6%), 25-27 years (n = 284, 37.7%), 28 years and above (n = 89, 11.8%).

3.   170 (22.6%) participants are enrolled in teacher-education program at Institution 1, and 60 (8%) at Institution 2, 79 (10.5%) at Institution 3, 53 (7%) at Institution 4, 84 (11.2%) at Institution 5, 185 (24.6%) at Institution 6, and 122 (16.2%) at Institution 7.

4.   355 (47.1%) respondents are enrolled in BS Education program, 122 (16.2%) in B.Ed. Secondary programs, and 276 (36.7%) in B.Ed. Elementary program.

5.   227 (30.1%) respondents were studying in the 1st year of their teacher education program followed by 183 (24.3%) in 2nd year, 204 (27.1%) in 3rd year, and 139 (18.5%) in 2nd year respectively.

6.   The overall mean score for expert teaching style was the highest (M = 4.17) followed by formal authority (M = 3.49), Facilitator (M = 3.47), Personal Model (M = 3.41) and Delegator Teaching Style (M = 2.53) respectively. The majority of teacher-educators seem to use the expert teaching style, since it received the highest mean score.

7.   The student-teacher possesses an average environmental knowledge (M = 3.45), above average social knowledge (M = 3.93), and below average economic knowledge

(M = 3.02) pertinent to SD. The student-teachers reported an overall average sustainability knowledge (M = 3.47).

8. The student-teacher reported an above average environmental (M = 3.66), social (M = 3.61), and economic attitude (M = 3.64) pertinent to SD. The student-teachers reported an overall above average sustainability attitude (M = 3.64) towards sustainable development.

9. The student-teacher reported below average environmental behavior (M = 2.73), average social behavior (M = 3.11), and below average economic behavior (M = 3.01) pertinent to SD. The student-teachers reported an overall below average sustainability behavior (M = 2.95). Student-teachers score lower on the behavioral dimension.

10. The overall SC score was 3.35 which is a below average score. This exhibit that student-teachers in Rawalpindi and Islamabad region overall has below average SC.

Section II: Analysis of perceived teaching styles of students' teachers based on demographics.

11. The student-teacher perception of all teaching styles did not vary significantly based on gender. i.e., $p > 0.05$.

Analysis of Variance based on Age.

12. No significant difference was found in the student-teachers' perception of their teacher-educators' expert ($p = 0.07 > 0.05$). However, significant age-based differences were found in student-teachers' perception of formal authority (Welch's $F_{(3, 309.2)} = 7.11$, $p < 0.0005$), personal model ($F_{(3, 749)} = 2.74$, $p < 0.042$), facilitator ($F_{(3, 317.6)} = 9.264$, $p < 0.000$), and delegator teaching style ($F_{(3, 302.8)} = 11.29$, $p < 0.000$).

Section IV: Analysis of student-teacher sustainability consciousness based on demographics.

13.   A significant difference in the student-teachers' environmental knowingness was found based on their gender i.e., 0.18 (95% CI, 0.018 to -0.345), t (333.725) = 2.189, p = 0.029, d = 0.18. Male student-teacher (M = 3.58) have slightly higher environmental knowledge compared to their female counterparts (M = 3.40)

14.   A significant difference in the social knowledge can be explained based on the gender i.e., 0.35 (95% CI, 0.24 to 0.46), t (543.86) = 6.294, p = 0.000, d = 0.42. The male student-teacher (M = 4.19) have significantly higher social knowingness than female student-teachers (M = 3.84).

15.   No Gender-based difference in student-teachers economic knowingness scores were found and they have below average economic knowingness i.e., p > 0.05.

16.   Gender-based difference was not found in student-teachers environmental attitude i.e., -0.23 (95% CI, -0.41to -0.048), t (292.592) = -2.495, p = 0.013, d = 0.22. Moreover, the mean scores reported by the male student-teacher (M = 3.48) is slightly lower than the mean score reported by their female counterparts (M = 3.71). Both male and female have a fair environmental attitude.

17.   Gender-based difference was not found in student-teachers social attitude and difference can't be explained based on their gender (p > 0.05). Moreover, a positive and above-average social attitudes toward SD were found among both male and female student-teachers.

18.   No statistically significant difference in the student-teachers' economic attitude was found based on their gender (p > 0.05). A positive and above-average economic attitude toward SD was found among both male and female student-teachers.

19.   A statistically significant difference in the environmental behavior was found based on student-teachers,' gender i.e., 0.39 (95% CI: 0.21 to 0.56), t (284.419) = 4.384, p = 0.000, d = 0.40. Both male and female student-teachers exhibit below-average environmental behavior, however, female student-teachers have marginally higher environmental behavior compared to their male counterparts (M = 3.01 vs. M = 2.63).

20.   A statistically significant difference can be explained in the social behavior based on the gender of the student-teachers. This difference is 0.26 (95% CI: 0.06 to 0.40), t (329.4) = 2.704, p = 0.002, d = 0.22. Furthermore, the mean scores that were recorded by male student-teachers are better than their female counterparts (M = 3.31 vs. M = 3.04).

21.   A statistically significant difference can be explained in the economic behavior based on the gender of the student-teachers. This difference is 0.30 (95% CI: 0.11 to 0.50), t (751) = 3.059, p = 0.002, d = 0.22. Furthermore, the mean scores that were recorded by male student-teachers are better than their female counterparts (M = 3.23 vs. M = 2.93).

Analysis of Variance based on Age.

22.   Environmental attitude score was statistically significantly different between student-teachers of various age groups, Welch's F (3, 294.7) = 12.26, p = 0.0005. The results suggest that environmental knowingness score increased with the increase in age i.e., 19-21 year (3.13 ± 1.04), 22-24 Years (3.36 ± 1.13), 25-27 Years (3.63 ± 0.0.83), to 28 & above (3.73 ± 1.08).

23.   Social Knowingness score was statistically significantly different between student-teachers of various age groups, Welch's F (3, 319.26) = 4.735, p = 0.003. The results suggest that social knowingness score increased with the increase in age i.e., 19-

21 year (3.82 ± 0.98), 22-24 Years (3.80 ± 0.06), 25-27 Years (4.03 ± 0.79), to 28 & above (4.06 ± 0.86).

24.   No statistically significant variation in student-teachers' economic knowingness over the various years i.e., p = 0.937 > 0.05.

25.   There was a statistically significant environmental attitude score among student-teachers of various age groups, F (3, 749) = 3.598, p = 0.013. Tukey post hoc analysis revealed that the student-teachers belonging to age group 28 & above have significantly different and higher mean environmental attitude scores compared to the other age groups.

26.   Social attitude score was statistically significantly different among student-teachers of various age groups, Welch's F (3, 319.26) = 4.735, p = 0.003. The results suggest that social knowingness score increased with the increase in age i.e., 19-21 year (3.47 ± 0.86), 22-24 Years (3.60 ± 0.78), 25-27 Years (3.62 ± 0.80), to 28 & above (3.89 ± 0.79).

27.   The results suggest economic attitude score was statistically significantly different between student-teachers of various age groups, Welch's F (3, 319.92) = 4.328, p = 0.005. Further, student-teachers belonging to age group 28 & above have higher mean economic attitude scores compared to the student-teacher of other age groups.

28.   One-way Welch ANOVA found no statistically significant difference in environmental behavior (p = 0.07 > 0.05), social behavior (p = 0.738 > 0.05).

29.   economic behavior score was statistically significantly different between student-teachers of various age groups, F (3, 749) = 2.725, p = 0.043. Similarly, Tukey post hoc analysis revealed that the student-teachers belonging to age group 28 & above

have significantly different and higher mean economic behavior scores compared to the student-teacher of 19-21 years age group [(0.42, 95% CI (0.04 to 0.82), $p < 0.03$].

Analysis of Variance based on academic Program.

30.   One-Way ANOVA findings suggest no academic program-based differences were found in student-teachers' environmental knowingness enrolled in various teacher education programs (F (2, 750) = 2.503, $p = 0.08$). Student-teachers studying in B.Ed secondary program exhibited the highest environmental knowledge (M = 3.60) followed by BS Education (M = 3.46) and B.Ed Elementary (M = 3.36).

31.   One-Way ANOVA findings suggest no academic program-based differences exist in student-teachers' social knowingness enrolled in various teacher education programs (F (2, 750) = 0.009, $p = 0.991$). Student-teachers studying in all the educational programs have almost equal and fairly above average mean score.

32.   One-Way ANOVA findings suggest no academic program-based differences exist in student-teachers' economic knowingness enrolled in various teacher education programs (F (2, 750) = 1.384, $p = 0.251$). Student-teachers studying in all these programs have below average economic knowledge.

33.   One-Way ANOVA findings suggest no academic program-based differences were found in student-teachers' environmental attitude enrolled in various teacher education programs (F (2, 750) = 1.137, $p = 0.321$). Student-teachers studying in all these programs have fairly above average environmental attitude.

34.   One-Way ANOVA findings suggest no academic program-based differences were found in student-teachers' social attitude enrolled in various teacher education programs (F (2, 750) = 1.365, $p = 0.256$). Student-teachers studying in all these programs have fairly above average social attitude.

35.   One-Way ANOVA findings suggest no academic program-based differences were found in student-teachers' economic attitude enrolled in various teacher education programs (F (2, 750) = 1.722, p = 0.179). Student-teachers studying in all these programs have fairly above average economic attitude.

36.   One-Way ANOVA findings suggest no academic program-based differences were found in student-teachers' environmental behavior enrolled in various teacher education programs i.e., (F (2, 750) = 0.253, p = 0.777). Student-teachers studying in all these programs exhibited below average environmental behavior i.e., M ≤ 3.5.

37.   Student-teachers enrolled different teacher-education programs did not exhibit any statistically significant difference in social behavior i.e., (F (2, 750) = 0.455, p = 0.635). Student-teachers studying in all these programs exhibited below average social behavior i.e., M ≤ 3.5. However, student-teachers in all these programs reported the social behavior highest.

38.   Student-teachers enrolled different teacher-education programs did not exhibit any statistically significant difference in economic behavior (F (2, 750) = 0.167, p = 0.846). Economic behavior has the lowest scores compared to the other two dimensions.

Analysis of Variance based on Year of study.

39.   According to the results of Welch one-way ANOVA, student-teachers studying in various years does not have a significant difference in the environmental behavior. i.e., p = 0.107 > 0.05.

40.   A one-way Welch ANOVA results suggest that social knowingness score was statistically significantly different among student-teachers studying in different semesters, Welch's F (3, 399.61) = 9.657, p < 0.0005. The results of the Games-Howell post hoc analysis revealed that the student-teachers enrolled in 4th year have the highest social knowingness score and have significantly higher score compared to the student-

teacher studying in 1ˢᵗ [(0.36, 95% CI (0.14 to 0.59), $p < 0.0005$] and 2ⁿᵈ (0.29, 95% CI (0.06 to 0.51) $p = .005$] years respectively. Moreover, no significant difference in the social knowingness between the mean scores of 3ʳᵈ and 4ᵗʰ year was found i.e., $p > 0.05$.

41.   One-Way Welch ANOVA results suggest no academic year based difference was found in student-teachers' economic knowingness studying in various academic years i.e., $p = 0.393 > 0.05$. Student-teachers have below average economic knowingness irrespective of their year of the study.

42.   One-Way ANOVA results suggest student-teachers studying in various years does not have a significant difference in the environmental attitude i.e., $p = 0.201 > 0.05$.

43.   Social attitude score was statistically significantly different between student-teachers studying in different years, Welch's $F (3, 402.224) = 7.045$, $p < 0.0005$. Social attitude score increased with the increase in year i.e., 1st year (3.49 ± 0.80), to 2nd (3.58 ± 0.87), to 3rd (3.62 ± 0.79) to 4th (3.83 ± 0.63). Moreover, Games-Howell post hoc analysis revealed student-teacher studying in 4th year have significantly higher social attitude compared to the student-teacher studying in 1st [(0.33, 95% CI (0.14 to 0.53), $p < 0.0005$], 2nd (0.25, 95% CI (0.03 to 0.47) $p = .016$], and 3rd (0.20, 95% CI (0.006 to 0.40), $p = .040$] years respectively. Moreover, no statistically significant difference in social attitude was detected in the other combinations. i.e., $p > 0.05$.

44.   Student-teachers studying in various years does not have a significant difference in the economic attitude. i.e., $p = 0.078 > 0.05$.

45.   One-Way Welch ANOVA results suggest student-teachers studying in various years does not have a significant difference in the environmental behavior i.e., $p = 0.10 > 0.05$. Student-teachers exhibited a below average environmental behavior irrespective of their year of the study.

46.	One-way Welch ANOVA results suggest student-teachers studying in various years does not have a significant difference in the economic attitude (p = 0.385 > 0.05). Student-teachers exhibited a below average social behavior irrespective of their year of the study.

47.	Student-teachers studying in various years does not have a significant difference in the economic behavior based on the results of one-way ANOVA (p = 0.175 > 0.05). Student-teachers exhibited a below average economic behavior irrespective of their year of the study.

Analysis of Variance based on Educational Institution

48.	No significant difference can be explained in student-teachers' environmental knowingness based on their educational institutions i.e., F (6, 746) = 1, p = 0.145. The student-teachers of NUML have the highest environmental knowingness followed by Institution 1. Student-teachers studying in the rest of educational institution have below average environmental knowledge.

49.	The results suggest that no significant difference can be explained in student-teachers' social knowingness based on their educational institutions i.e., F (6, 746) = 1.045, p = 0.395. Student-teachers in all the educational institution exhibited above average social knowledge.

50.	The results suggest that no significant difference can be explained in student-teachers' economic knowingness based on their educational institutions (i.e., F (6, 746) = 1.357, p = 0.230). Moreover, student-teachers in all the educational institutions have below average economic knowledge.

51.	The results suggest that no significant difference can be explained in student-teachers' environmental attitude based on their educational institutions (i.e., F (6, 746)

= 0.469, p = 0.832). Moreover, student-teachers in all the educational institutions have above average environmental attitude.

52.   The results suggest that no significant difference can be explained in student-teachers' social attitude based on their educational institutions (i.e., F (6, 746) = 0.730, p = 0.626). Moreover, student-teachers in all the educational institutions have above average social attitude.

53.   The results suggest that no significant difference can be explained in student-teachers' economic attitude based on their educational institutions (i.e., F (6, 746) = 1.034, p = 0.402).

54.   The results suggest that no significant difference can be explained in student-teachers' environmental behavior attending various educational institutions (i.e., F (6, 746) = 1.327, p = 0.243). Moreover, student-teacher reported a below average score on environmental behavior.

55.   The results suggest that no significant difference can be explained in student-teachers' social behavior attending various educational institutions (F (6, 746) = 1.575, p = 0.151). Although, student-teachers reported a below average (mean less than 3.5) social behavior, yet the score on social dimension is significantly higher compared to environmental and economic behavior dimension.

56.   The results suggest that no significant difference can be explained in student-teachers' economic behavior attending various educational institutions (F (6, 746) = 1.343, p = 0.235). Student-teacher reported significantly lower score on economic dimension.

Section V: Relationship between teaching styles and sustainability consciousness

57.   The values of R^2 are greater than 0.1 which shows that all the dimensions of SC established a predictive strength except of economic attitude and environmental knowingness.

58.   The predictive relevance (Q^2) is established for any value greater than zero. The results suggest that all the dependent variables have predictive relevance greater than zero, hence the predictive relevance was established.

59.   To assess model fitness SRMR values were utilized. The acceptable range for SRMR is between 0 and 08. The value of SRMR is 0.07 which lies in the acceptable range. The value of the SRMR suggest model fitness.

60.   The finding of the path analysis suggest that expert teaching style have a positive effect on knowledge ($\beta = 0.22$, $p = 0.045 < 0.05$), no effect on attitude ($\beta = -0.01$, $p = 0.076 < 0.05$), and no effect on the behavior ($\beta = 0.02$, $p = 0.63 > 0.05$) towards SD.

61.   The finding of the path analysis suggests that formal authority teaching style have a positive effect on knowledge ($\beta = 0.24$, $p = 0.000 < 0.0005$) and attitude ($\beta = 0.32$, $p = 0.000 < 0.0005$), and no effect on the behavior ($\beta = 0.03$, $p = 0.47 > 0.05$) towards SD.

62.   The finding of the path analysis suggest that personal model teaching style have no significant effect on knowledge, attitude, and behavior towards SD i.e., $p > 0.05$.

63.   The finding of the path analysis suggest that facilitator teaching style has a significant effect on knowledge ($\beta = 0.16$, $p = 0.000 < 0.0005$) and attitude ($\beta = 0.28$, $p = 0.000 < 0.0005$) and no significant effect on the behavior towards SD i.e., $p = 0.19 > 0.05$.

64.   The finding of the path analysis suggest that facilitator teaching style has a significant effect on knowledge ($\beta = 0.14$, $p = 0.000 < 0.0005$), attitude ($\beta = 0.19$, $p = 0.000 < 0.0005$), and behavior ($\beta = 0.58$, $p = 0.000 < 0.0005$).

Qualitative findings

Based on semi-structured interviews, student-teachers' knowledge, attitude, and behavior towards SD were explored. Moreover, the students-teachers were also asked to explain how their teachers-educator teaching style/approach affects their attitude and actions toward SD. Following are research questions-wise findings of qualitative data after thematic analysis.

Research Question 1

What teaching styles are followed by teacher-educators to educate students for SD?

1.   Most of student-teachers responded that teacher-educator is applying both student-centered, and teacher centered approaches to teach the student for SD.

2.   It is found that mostly Teachers are using lecture-based teaching style in their classrooms.

3.   Student-teachers respond that along with lecture method, teachers are also applying activity-based leaning, field trips, projects, collaborative teaching, community services and discussion method of teaching.

Research Question 2

To what extent do students' teachers have the knowledge, Behavior, and actions towards SD?

1.   The majority of students' teachers stated that SD is the best utilization of resources for the present and saving the resources for the future.

2.   Student educators have a general knowledge of the three pillars of SD, but their grasp of these pillars is weak.

3.   Most of the student-teachers know the environmental dimension, and students answered about the environmental dimension of sustainability is to prevent the wastage of natural resources, like water, gas, and electricity. Moreover, maintenance and effective use of these resources save the natural environment. The natural environment is mostly damaged when people use non-environmentally friendly products. The use of these products causes environmental pollution.

4.   Students agreed that the social dimension of SD refers to a peaceful society, where everyone has access to resources for a healthy lifestyle, respects cultural norms, and values gender equality, equity, and justice.

5.   Research also shows that while student-teachers are knowledgeable about SD, their understanding of economic growth is lacking. The majority of them said that sound planning is essential for any nation's economic growth. In addition, the key strategy for economic growth is to employ local goods and build local industries.

6.   Most of the student-teachers responded that we should need to reduce industrial waste that produces harmful effects on the environment.

7.   It is found that We should plant more trees, use less water, make our bags instead of buying plastic ones, utilize stationary things wisely, and enhance the transportation system, most of the students responded that industries need to produce environmentally friendly products for securing the natural environment.

8.   Most of the respondents suggested that we should educate people for saving our natural environment because education is the main pillar of SD.

9.   Most of the respondents emphasized the role of education in society's development. student-teachers responded that based on education we can reduce the

problem of poverty and unemployment, therefore, the budget for education needs to be focused.

10. It is found that students teachers have attitude towards economic development, most of respondent replied that we need to maintain between income and spending. Furthermore, by Establishing new businesses locally we can promote economic development.

11. Most of the student responded that by increasing educational attainment and giving basic skills to students can improve economy of country.

12. Mostly student show positive behavior towards environmental protection, students stated that they are avoiding use of plastic bags, try to recycle the old products, do plantations, try to give awareness about causes of pollution, try to save water and try to off extra lights for saving electricity.

13. The majority of student instructors said that they are attempting to work in groups and have accountable for others. Furthermore, during the Covid-19 epidemic, most students contributed their efforts to help the poor.

14. The majority of respondents reported undertaking freelancing to support their families and for their everyday lives, it is found that student-teachers take very few steps toward economic growth.

Research Question 3

How Teaching styles are responsible for Change in SC?

1. It has been discovered that various project-based activities during the study of sustainability-related subjects positively change the behavior of student-teachers toward SD.

2.   The majority of students responded that discussions in class about sustainability issues changed their attitudes toward SD.

3.   Teacher lectures and classroom reading assist learners in learning about SD.

5.3   Discussion

The research explored the teacher-educators' teaching styles and student-teachers' sustainability consciousness. Further, the present study investigated difference in student-teachers' perception based on their gender and age in their teacher-educator teaching style, differences in student-teachers' SC based on gender, age, program, and the year of the study and university, and relationship between the teacher-educator teacher styles and student-teacher SC. This section begins with a short examination of the predominant teaching style of teacher-educators in the selected seven public sector institutions. Following a discussion on prevalent teaching styles, differences in student-teachers' perception about teaching styles have been discussed. Following that the current state of SC among preservice teachers at seven public sector institutions and differences in the student-teacher SC based on their gender, age, university, academic program enrolled, and year of study of the respondents have been discussed. The section is concluded by discussion how various teaching styles have been associated with student-teachers' knowledge, attitude, and behavior. Discussions of the studies have been made in the context of earlier research on sustainability education, SC, and the theoretical underpinnings of the study.

The primary objective of the research was to assess the teacher-educators' teaching style while teaching sustainability related concepts/themes. The expert teaching style has the highest mean score suggesting most of the teacher utilizes expert teaching style. Previous research conducted in Pakistan also found similar results. For

example, Mazloom and Hussain (2020) conducted a study to assess teachers teaching styles and found that mostly teachers utilized expert teaching style. Similarly, Mujeeb and Afzal (2021) also found in their study that majority of the teachers follows an expert teaching style. Moreover, Ihsan, Malik and shahid (2019) study's results are also align with the results of present study and suggested that mostly teachers utilize expert teaching style. Teachers adopting the "Expert" style aim to equip students with the necessary preparation for success in life by sharing their own expertise and knowledge with them (Grasha, 1994). These teachers also strive to make the content more rigorous and relevant, as part of their efforts to prepare students (Grasha, 1994). The reason could be adopting expert teaching style is to make the students aware about sustainability. The objective of adopting the "Expert" teaching style is to educate students on sustainability and equip them with the necessary knowledge and skills for a sustainable future. Similarly, Arbabisarjou, Akbarilakeh, Soroush, & Payandeh, (2020) also conducted a study to measure teaching styles of faculty members. Their findings indicated a prevalence of expert and delegator teaching styles, with limited use of personal model, formal authority, and facilitator styles among the faculty. The findings of a study, even though it was conducted in a different context and field, exhibit a similar characteristic with regards to the expert teaching style. In contrast, the results of a study conducted by Soleimani (2020) showed that the facilitator style is the predominant teaching style of teachers. The qualitative results of study also supported the quantitative findings of the study, for example one of the respondents responded that "*Our teacher utilized mainly lecture method. I am not going to deny that lecture method was useful in enhancing our knowledge and understanding*". Likewise, one other student responded that "*we memorized the content for passing the exams. The process is pretty standard all over; teacher will come, deliver the lecture, give students*

notes, student will memorize, and will complete the course. This process is suitable for manufacturing, but not for producing system thinkers. I don't think these methods hardly changed my attitude and behavior."

The study was also aimed to explore the student-teachers SC. The SC construct has been divided into three sub-dimensions i.e., the environment consciousness, social consciousness, and economic consciousness. All these three dimensions further constitutes the knowledge, attitudes, and behaviors towards the three dimensions of sustainability (Gericke, Boeve-de Pauw , & Olsson, 2019). The first step in assessing the student-teachers SC was to examine student-teachers' environmental, social, and economic knowingness. The results suggest that overall student-teachers have below average knowledge pertinent to SD and in general, student-teachers have a near average knowledge related to environmental issues, while a fair and above average social knowledge pertinent to SD. Student-teacher reported lowest and below average knowledge pertinent to economic issues. Khadim, Qureshi, & Khan, (2022) conducted a study on individuals' awareness about sustainability, the findings of study shown that mostly respondents have environmental knowledge about sustainable development, but of low economic knowledge about sustainability. The findings of the present study are also aligned with the results of Khadim, Qureshi, & Khan, (2022).

Most of the student-teacher have a fair idea of SD and related theme, however, most of them associated the term with the environmental sustainability and social sustainability. Very few had discussed the term in economic perspective. The results of the current study suggest that student-teachers exhibited above average environmental and social knowledge, however, they have below average economic knowledge. The result is consistent with the research by (Bourne et al., 2022).

The results of the quantitative data suggest that student-teachers have average knowledge pertinent to the environmental issues like reducing water consumption, nature preservation, waste reduction, and shift toward renewable energies. In the quantitative strand, most of them referred it as the *preservation of natural resources, recycling, and reusing, and climate changes.* A few mentioned, "*All members of the community should be encouraged to use their resources wisely*", "*the depletion of our planet's water and other resources is a result of people's reckless use of these resources*". This shows that student-teachers have a fair idea of the environmental issues. A study conducted in the USA showed that the majority of surveyed students view sustainability primarily as an environmental issue (Brian et.al, 2015).

In 2017, Kalsoom, Khanam, and Qureshi conducted a study to evaluate the sustainability awareness of student-teachers in Pakistan. Their findings showed that the student-teachers had a strong understanding of social aspects related to sustainable development. Similar to Kalsoom et al.'s study, the current study also found that student-teachers believed in the right to a long and healthy life for all individuals, peace, equality, access to education, and respect for culture. Both the qualitative and quantitative data suggest the same results. Student-teachers mentioned statements like "*Plastic bags hurt the ecology*", "*Donations may assist us meeting society's demands*", "*A culture of peace, harmony, and respect needs to be promoted*". This implies that student-teachers are aware of environmental and social issues and their solutions, the results align with previous research (Berglund & Gericke, 2016).

Furthermore, the results also revealed that student-teachers' have higher scores on social attitude towards sustainability and social behavior followed by environmental attitude and environmental behavior but have low economic attitude and behavior towards sustainable development. Although, the quantitative data suggests higher

scores on social behavior, however during interviews, student-teacher mostly mentioned environmental initiatives on a question related to sustainable behavior /actions. as also demonstrated in Khanum's study (2019, p.157-158). There could be a few explanations for this minor discrepancy in the qualitative and quantitative data. One is the difference of tool for data collection i.e., questionnaires give respondent time and anonymity to the respondent while on the other hand, respondent may feel nervousness and anxiety responding to the interview questions (Moffatt, White, Mackintosh, & Howel, 2006).

Secondly, the concepts of environmental, social, and economic sustainability are complex and intertwined that they are not easy to separate from one another. Hence, student-teachers may have mentioned these issues as they are apparently easy to talk about and more apparent in our society and around the world. Some student-teachers understand the interrelationship between the various dimensions of SD, for example, one student-teacher stated that: All the dimensions of SD are intertwined, and one cannot be achieved without achieving the other. It's not like that we can prioritize one and leave the other. The findings are in line with the previous research (Berglund et al., 2014; Gericke et al., 2019; Marcos-Merino et al., 2020). Marcos-Merino et al. (2020) also find the similar results and stated that the mean score on social dimension has the highest value in all the three sub-dimensions i.e., knowledge, attitude, and behavior dimension while the economic dimension has the least scores. Berglund et al. (2014) found that students have the highest scores on social dimension followed by the environmental and economic dimension. An interesting statistic from the Berglund et al. (2014) was that students studying in both the ESD-profiled and non ESD-profile schools had the highest score on social dimensions and no difference was found in the mean scores of both the ESD Profiled and Non-ESD Profiled students. These results

show that high priority has been given to the social issues in connection with sustainability. Kalsoom (2017) also stated that student-teachers have relatively higher exposure to social and environmental issues in the curriculum and teaching compared to the economic issues. Another important reason is that "statements about the value of social aspects might be particularly easy to agree with when no additional aspects must be considered that could incur costs or conflict with objectives related to the other two dimensions" (Berglund & Gericke, 2016). On the contrary, the results of the current study are in disagreement with the results of Kalsoom (2017). Contrary to the current research, Kalsoom (2017) found that student-teachers' scores on the economic dimension were the highest. One of the key reasons is the student-teachers' exposure to the relevant content and issues. The higher score on the social knowledge may be associated with the overall educational experience of the student-teachers as well.

Pakistan's commitment to the United Nations Decade of Education for SD (2005-2014) and other measures to adopt or integrate sustainability into the country's educational system is called into question by these findings. All of the participants in this research were enrolled in a teacher education program that had approved by the National Accreditation Council for Teacher Education. Additionally, they used the 2012 curriculum updates approved by Pakistan's Higher Education Commission. Also, the evidence reveals that the reform of teacher education has failed to adequately inform the next generation of educators on the significance of sustainability and the appropriate standards to which they should be held. The most probable causes of this are the teacher-educator instructional style (i.e., teaching style) in Pakistan and the absence of focus on ESD in teacher education.

In order to understand the student-teachers understanding of SD concepts, student-teachers were asked to define the concept during their interviews. The

interviews results revealed that most of the student-teachers have a fair idea of the term *"SD"*. A student-teacher defined SD as "the development in which individuals fulfill their needs keeping in view the personal and country needs for present and the future". This definition is nearest to the most common definition of SD as the development that "meets the needs of the current generation without compromising the needs of future generation". Most of the student-teacher have a fair idea of SD and related theme, however, most of them associated the term with the environmental sustainability and social sustainability. Very few had discussed the term in economic perspective (Bourne et al., 2022). For example, a student-teacher stated that ""*SD is the utilization of resources in the manner that may not have any direct / indirect harmful effect on the future generations. Therefore, every development is sustainable if it does not affect our ecosystem and society presently and, in the future"*. The economic aspect of SD needs the consideration of teacher-educators. Upon asking about the three pillars of SD, most of the student-teachers mentioned economic, social, and environmental dimensions, but some does not have a clear understanding of the three pillars of the SD. Some confused SD goals with the pillars of the SD. Most of them have an introduction with SD term during their time at their respective teacher-education institutions. Some student-teachers mentioned subjects like *contemporary trends and issues in education, human resource development, research methodology, environmental education, social studies, and school community and teacher* contains sustainability related themes and concept. These results show that, although, student-teachers have a fair idea of SD, there is room for improvement. As, the respondents mentioned that they studied themes / concepts related to SD, a dedicated course related to SD may be helpful to provide a better idea of SD and related concepts. Kalsoom (2017) and Nousheen et al., (2020) also suggested

the same to offer a standalone course to student-teachers for their complete understanding of the term, and the associated issues and their solution.

The third objective was to assess the differences in student-teachers' perception based on gender and age about their teacher-educator teaching style. The present research found no gender-based differences in student-teachers perception about their teacher-educators' teaching styles. The study conducted by Norzila, Fauziah, and Parilah (2007) investigated college students' perceptions and preferences of their English language lecturers' teaching styles. The results showed no differences in students preferred and perceived teaching styles based on gender. However, students preferred learner-centered teaching styles, while the lecturers predominantly used teacher-centered teaching styles. According to the studies by Ray, Garavalia, & Gredler (2003) and Liu & Lin (2010), if teachers are able to identify the strategy use of students in relation to their gender and learning abilities, they can effectively teach them to use learning strategies. This means that the teacher should adapt their teaching approach to the individual needs of each student based on their gender and learning abilities.

Similarly, Age-based differences in student-teacher perceptions of teacher-educator teaching style were also studied. However, age-based difference was found in student-teachers perception about their teacher-educator teaching styles. Student-teachers of various age group perceived their teacher-educator teaching style differently except for the expert teaching style. There was no difference in student perception of their teacher-educator expert teaching style. Which shows that, irrespective of the student-teachers age, they perceived their teacher-educator exhibit expert teaching style. The study by Samuelsson and Samuelsson (2016) found conflicting results regarding the gender-based perception of teaching practices. It was observed that male and female students have different views on their classroom environment and learning

experience. Male students reported that they are involved in more group work and have a greater influence on the lesson content and participation compared to females. This difference in perception could be due to male students remain more active in their classroom as compared to female students (Kelly, 1988). The study by Vikas & Mathur (2022) found that there was no significant effect of institutional type, gender, and age on a teacher's teaching style, indicating that students from different demographic backgrounds had a comparable learning experience in the classroom. These results align with the findings of the current study.

The fourth objective was to compare variance in SC of student-teachers based on demographic factors such as gender, age, academic programs, year of study, and educational institution. The first thing that was to assess whether or not the gender of the student-teachers impacted their perspectives on their SC. The results of this study indicate that male and female student-teachers have different levels of knowledge, attitudes, and behaviors pertinent to SD. According to the findings of this study, male student-teachers fared better than female student-teachers in terms of their understanding of the environment and social issues. The study findings are also aligned with the results of Tong, Fan, & Niu, (2017). Their study findings depicted that awareness of males about Water conservation is higher than the female awareness. On the contrary, female student-teachers have reported higher scores on environmental and social attitude scale compared to their male counterpart. No differences were found in economic knowledge and attitude. However, male student-teachers reported higher behavior compared to female counterparts. Kassinis, Panayiotou, Dimou, & Katsifaraki, (2016) Conducted a longitudinal study on gender and environmental sustainability, the study results shown that there is diversity between gender awareness and attitude towards environmental sustainability.

According to Arcury (1990), a person's gender may have a role in how much they know about the environment and how concerned they are about the environment. Tikka et al. (2000, p. 16) concluded that knowledge of the environmental issues appears to be associated with the gender. Six nations were surveyed by Gendall et al. (1995) to examine how well people knew about environmental issues. Overall, men were more educated than women in all six nations. The results of the current study are in line with the results of the previous studies. The current study also found that there is a significant difference in the mean scores of male and female student-teachers' environmental knowledge where male student-teachers reported a slightly higher knowledge about the environmental issues compared to their female counterparts. However, when it comes to environmental attitude, literature suggest that females are more concerned about the environment issues and have positive attitude than men (Davidson & Freudenburg, 1996). The current study also found similar results i.e., female student-teachers exhibited higher environmental attitude than the male student-teachers. The finding of the current research in line with the findings of the previous research (Oweini & Houri, 2006; Tikka et al., 2000). Tikka et al. (2000) also found that male individuals have less environmental attitude compared to females. The current study also found that male student-teachers' reported higher environmental behavior compared to female student-teachers. One of the key reasons is the aspect of socialization pattern of both males and females (Schahn & Holzer, 1990, p. 77). The male dominant culture in Pakistan provides more socialization opportunity to male than female students. Therefore, the status and roles of different genders may also affect their pro-environmental attitude and behavior. According to Benton and Funkhouser (1994), a study of undergraduate students, female students are less knowledgeable about the environment but are more concerned about pro-environmental issues than their male counterparts.

Similarly, the results of the current study suggest that study suggest that male student-teacher have higher social knowledge and behavior compared to females' student-teachers. Like environmental consciousness, the literature suggest that female students score higher on social consciousness and sub-constituents. For example, in a study conducted by Olsson and Gericke (2017) in Swedish context, the researchers found the female students have higher scores on social knowledge, attitude and behavior scales compared to their female counterparts. However, the results of the current study are in contradiction to the previous research. One of the key reasons may be the aspect of socialization in Pakistani society. Several studies like Reid and Foels (2010) and Rusticus and Hubley (2006) apprise that Gender-role socialization can take place at many stages/levels. Men may have quite different perspectives on the seriousness of the problem (for example environmental and social issues) and how it should be addressed. It is possible that gender disparities exist at both the conceptual level, and item operational and interpretation levels. The response is highly dependent on the socialization pattern and cultural cues of the society. Although, both the male and female student-teachers have a positive and fair social consciousness, the significant difference in the knowledge and behavior may be associated with their social exposure to the other people and issues around the society. Weisstein et al. (1971) argued that to comprehend why individuals do what they do, one must consider the setting/context in which they live. In societies like Pakistan, female students experience lack of socialization due to certain cultural and social constraints. The arguments here justify the results of the current study i.e., the male student-teachers have more exposure with the social issues and normally tends to engage in activities, which in turn positively impact their level of social knowingness and behavior.

Further, the study also examined the difference between male and female student-teachers economic consciousness. The results of the study suggest that most of the student-teachers have poor knowledge of economic issues and exhibit lower attitude and behaviors towards economic dimension of SD. The results of the current research are in line with the results of previous studies conducted by Olsson and Gericke (2017) and Dyment et al. (2015). Olsson and Gericke (2017) conducted the study to examine students' social consciousness in Swedish context and found that the effect of gender was not presented in economic dimension. Similarly, Dyment et al. (2015) conducted a study in the Australian context and found that most of student (45%) associate SD with the environmental sustainability. Moreover, only 3 percent of the student associated sustainable related issues with the economic dimension. The results are not surprising that most of the student-teachers associated the sustainability related issues with the environmental theme as their focus is dominated with the environmental issues. The qualitative strand of the current study also found the similar results in which mostly students associated sustainability with the environment. The results of the current study show that male and female student-teachers are equally inexperienced with the economic sustainability challenges. Further, it can also be inferred that both the students and instructors have unclear views about the economy's role in SD. This may also be associated with the missing economic aspects in the teacher-education curriculum.

The present-study also found that the student-teachers in different teacher-education program exhibited similar SC and no differences were found in the SC based on educational program. Additionally, the present research investigated whether or not there is a difference between student-teachers studying in various years of their degree program on SC scale and its sub-dimensions. The study results are also showing agreement with the findings of Sunthonkanokpong, & Murphy, (2019). The aim of this

study was to examine the awareness, attitudes, and actions of Thai pre-service education teachers towards economic, social, and environmental sustainability. The survey questions were designed based on UNESCO's learning objectives related to the 17 sustainable development goals (SDGs). The results of the study showed that pre-service teachers in their second year of the program reported higher levels of awareness compared to those in their first, third, fourth, and fifth years, with no significant differences observed among different program types.

The findings of the research indicate that there is no discernible change in the level of environmental and economic knowledge based on student-teachers current level of education i.e., year of study. On the other hand, student-teachers who are currently enrolled in more advanced semesters have a knowledge of social issues that is noticeably more advanced than those who are now enrolled in less advanced semesters. In a similar vein, there was found to be no significant change in the environmental and economic attitude of the student-teachers depending on the year in which they were presently enrolled; nevertheless, there was found to be a rise in the social attitude with the increase in semester (Sunthonkanokpong, & Murphy, 2019).

These results suggest that a visible change can be seen in the social dimension of sustainability in student-teachers in contradiction to the previous studies (Dyment et al., 2015; Olsson & Gericke, 2017). The primary reason for this may be the reason that most of the teacher-education curriculum in general and we as society in specific emphasize more on the social issues than the other two dimensions. Another possible explanation for this increase in the student-teachers social consciousness may be due to the number of courses/themes they studied pertinent to sustainability themes/issues during their degree. Kalsoom (2017) also endorsed a similar point and stated that teacher-education curriculum mostly emphasizes the social issues. Religious aspect

may also affect individuals' attitude and behavior. Further, mostly, religion has been viewed as the belief system and social institutions which shapes the people ways of thinking and acting. Hence, both the curriculum and the religion may be associated with the student-teachers high scores on the social dimension of sustainability.

The finding of the study also revealed that student-teachers studying in different educational institutions have similar knowledge, attitude and behavior towards the environmental, social, and economic dimensions of SD. No significant difference was found among the student-teachers based on the educational institution they were enrolled in. The primary reason for this may be that all the educational institutions were in Rawalpindi and Islamabad region and were following the course outlines recommended by the Higher Education Commission, Pakistan. Overall, all the educational institutions follow the same pattern of curriculum and instructional techniques. Based on this, the result of the current study implies that no significant organizational level interventions were introduce to precisely effect student-teachers SC and its constituents. Similar results were also found based on the different teacher-education programs. The results suggest that no significant difference in the student-teachers' environmental, social, and economic consciousness can be explained based on the program they were enrolled in. The aforementioned reasons also justify the no change in student-teachers' SC based on the program they were enrolled in.

The last objective of the study was to assess the relationship between various teaching styles with the student-teachers knowledge, attitude, and behavior. The relationship between various teaching styles with the knowledge, attitude, and behavior will be discussed in the subsequent paragraphs. First of all, the relationship between expert teaching style with the knowledge, attitude, and behavior was assessed. The results of the study suggested that expert teaching style have a positive and significant

relationship ($\beta = 0.041$, $p = 0.045 < 0.05$) with the student-teacher knowledge pertinent to SD. Expert teachers know what students need and deliver the relevant information. as Bronson-Pollacks, (2009) argues that Expert teaching style encourages students to expand their knowledge. Moreover, the Expert Teaching Style is defined by a high degree of content understanding in the subject area and places an emphasis on class preparation and the dissemination of information. Teacher-educator provide a wealth of material, covering a lot of ground (Grasha,1996). Based on this argument, it can be inferred that in the current study teacher-educator provides a wealth of information regarding the SD to student-teachers and hence enhancing student-teacher knowledge. Moreover, the expert teaching styles are the most prevalent teaching style. Similarly, the teacher-educator expert teaching style have a significant and negative effect on the effect on their student-teacher attitude towards SD. Grasha, (1996) emphasizes that a high level of Expert teaching style leads to effective and long-lasting learning outcomes. In the study, teachers who possess a high degree of Expert style are deemed to possess adequate subject matter expertise in their teaching.

One of the reasons for this may be the large size of the classes in Pakistani Universities, as Shaari et al. (2014) also stated that teachers use expert teaching styles when teaching large classes. Large number of students in a classroom possesses numerous challenges to effective teaching and learning. The teacher-educator focus on the knowledge dissemination affects their ability to change student-teacher's attitude and behavior towards SD.

The qualitative data also exhibited the same results. Most of the student-teachers stated that their teacher-educated mostly utilizes expert teaching style which result in enhancing their knowledge. For example, one student stated that,

We memorized the content for passing the exams. The process is pretty standard all over; teacher will come, deliver the lecture, give students notes, student will memorize, and will complete the course. This process is suitable for manufacturing, but not for producing system thinkers. I think these instructional methods provide us with some useful knowledge but hardly changed my attitude and behavior."

Similarly, another student commented,

"Our teacher utilized mainly lecture method. I am not going to deny that lecture method was useful in enhancing our knowledge and understanding. However, what I felt, this knowledge is temporary and most of us are not going to use it anywhere."

The results of the current study suggest that formal authority teaching style has a positive and significant effect on student-teacher knowledge and attitude towards SD. However, no relation was found with the behavioral aspect. The Formal Authority teaching style, as described by Grasha (1996), involves a clear and systematic approach to teaching, along with strict expectations. However, excessive use of this style can result in a rigid and inflexible approach to managing students and addressing their concerns. Teachers possessing formal authority teaching style believed that instruction should take the shape prescribed by the school, taking into account the aims of instruction and the norms for student conduct articulated in the code of conduct. Such educators tended to be less open to student input and instead focused on maintaining order and discipline in the classroom. Students' ability to think critically and creatively is stifled by this authoritative approach to teaching, since the instructor presumably believed their method to be the most effective. In such cases, the teacher rarely utilizes any innovative and out of the box content or instructional techniques and follows the

course outline, and rules and regulations strictly, which negatively affect student-teachers attitude and behavior (Buang et al., 2019). The qualitative data also suggested similar results. For example, one student-teacher commented,

> *I found the education as a very dry and boring subject. Nothing new and innovative, no student involvement, assignments are boring. Teacher strictly follows the course outline and showing no flexibility towards students. We are considering as empty vessels that needs to be fill during the course of 4.5 months. I also found teacher-educators reluctant to use technology and innovative approaches in their teachings. Obviously, course is design to impart necessary knowledge to students, but not sure about the attitudinal and behavioral changes.*

The next was to assess the relationship between the personal model teaching style and student-teacher knowledge, attitude, and behavior towards SD. The personal model seems to have no statistically significant effect on the student-teacher knowledge, attitude, and behavior towards SD. According to Grasha (1996), the Personal Model teaching style involves the teacher acting as a role model and encouraging students to observe and imitate their approach. Teachers who use this method believe it to be the most effective form of instruction. However, Grasha also notes that it can lead to students feeling inadequate if they are unable to meet the expectations and standards set by the teacher. So, based on the potential for students to feel inadequate, there is a chance that this teaching style may not result in a significant impact on students' sustainability consciousness.

The next was to assess the relationship between the facilitator teaching style and student-teachers' knowledge, attitude, and behavior towards SD. The results of the quantitative data suggest that facilitator teaching style have a positive and statistically

significant effect on the student-teacher knowledge and attitude towards SD, however, found no effect on the behavior towards SD. The study by Wetzel, Potter, & O'Toole in (1982) investigated the impact of teaching styles on student attitude and achievement. The results showed that a teaching approach that involves collaboration with students and encourages independent learning had a significant effect on student attitude. Despite being ESD a new concept in the field of researches, especially in education, these findings provide support for current study by highlighting the importance of teaching in shaping student attitudes. Additionally, a study by Shaari, Yusoff, Ghazali, Osman, & Dzahir (2014) emphasized the benefits of a facilitator teaching style in promoting problem-solving and collaboration among students, leading to improved student attitude and achievement. The study by Karamustafaoğlu, ÇAKIR & Celep, (2015) also supports the idea that facilitator teaching styles play a crucial role in shaping students' attitudes towards learning (Ames ,1983).

Moreover, the delegator teaching styles has been found as the key teaching style to change student-teacher knowledge, attitude, and behavior. Literature also supports the idea of utilizing student-centered teaching styles (facilitator / delegator) in order to promote an effective teaching and learning environment (Buang et al., 2019). The qualitative data also provide similar results endorsing the utilization of facilitator and delegator teaching style for teaching sustainability related concepts.

> *We always heard about poverty, social justice, and equality but we did not feel them before visiting orphanage and conducting a research project on social issues around us. In this exercise, everyone has to share his or her experiences in the classroom. I think, the books may not have been taught us the way that one experience taught us.*

These results suggest that the development of student-teachers' environmental and social knowledge and attitudes may be achieved using a mix of student-centered and teacher centered teaching styles, however, the behavioral changes require instructional and pedagogical innovation. There seems to be a consensus in the literature on sustainability education that teaching sustainability-related concepts would increase students' knowledge and attitudes about sustainability. However, the development of sustainable behaviors is a more complex process that depends on how different individual and environmental factors interact with each other, and is not likely to happen automatically as a result of instruction (Kollmuss & Agyeman, 2002) addressing the issues of sustainability education (Herranen et al., 2018). Generally, student-centered approaches have been viewed as a viable strategy for addressing the issues of sustainability education (Herranen et al., 2018). However, the efficiency of such a teaching method might be heavily dependent on the faculty's positive attitude and enough expertise on sustainability education (Rydhagen & Dackman, 2011). Some teacher-educators and student-teachers are new with the concept and practices of sustainability education. Thus, teacher-educators in the present study imparted knowledge pertinent to sustainability-related concepts using certain pedagogies; yet they may be unskilled and hesitant to enable students' active and meaningful learning about sustainability due to a lack of resources and support.

5.4   Conclusions

The current study leads to important conclusion regarding the status of student-teachers' Sustainability consciousness and teacher-educators teaching styles in teacher-education programs in Pakistan. Following are the conclusions based on the results of the research objectives and hypotheses.

Teacher-educators use a mix of teaching styles, with the expert teaching style being the most prevalent. The overall mean score for teaching styles was highest for the expert style, followed by formal authority, facilitator, personal model, and delegator teaching styles. Teacher-educators employ a combination of student-centered and teacher-centered approaches, such as lectures, activities, field trips, projects, and discussions, to educate students on sustainability.

Student-teachers have above-average knowledge and attitude towards sustainable development but below-average behavior. The overall score for sustainability consciousness is below average. Student-teachers demonstrate good understanding of sustainable development, but the behavioral dimension requires attention. Their knowledge of the three pillars of sustainability (environmental, social, and economic) is generally sound, although their understanding of the economic dimension is weak. Positive attitudes and behaviors towards sustainability, such as reducing plastic use, planting trees, and conserving resources, are evident among most student-teachers.

Student-teachers' perception of their educator teaching styles does not significantly vary based on gender. However, significant differences were found based on their age. This indicates that teacher-educators' teaching style remains consistent for both male and female student-teachers. Teacher-educators' teaching styles do not vary with student-teacher gender.

Significant differences were found in student-teachers' environmental and social knowingness based on their gender, with male student-teachers having higher environmental and social knowingness compared to female student-teachers. There was no significant difference in student-teachers' economic knowingness based on gender. Moreover, no significant difference was found in student-teachers' environmental,

social, and economic attitudes based on gender. However, a significant difference was found in environmental behavior based on gender, with female student-teachers exhibiting higher environmental behavior. Additionally, a significant difference was found in social and economic behavior based on gender, with male student-teachers exhibiting higher behavior in these dimensions compared to female student-teachers.

There are significant differences in environmental, social, and economic knowledge, attitudes, and behavior between student-teachers of different age groups. Student-teachers aged 28 and above exhibit higher sustainability consciousness compared to other age groups. However, there are no differences in the environmental, social, and economic knowingness, attitude, and behavior of student-teachers enrolled in various teacher education programs.

Formal authority and facilitator teaching styles have a positive effect on knowledge and attitude towards sustainable development. The expert teaching style has a positive effect on knowledge but no effect on attitude or behavior. The personal model teaching style has no significant effect on any of the dependent variables, while the delegator teaching style has a significant effect on all the dependent variables. Project-based activities and discussions are found to have a positive impact on changing students' attitudes and behaviors towards sustainability.

5.5   Recommendations

The present study suggests following practical recommendations based on results;

1.   Teacher-educators may practice the facilitator, delegator and formal authority teaching styles combinedly in their classroom to educate students for sustainable development as these teaching styles can improve the students' knowledge and attitude towards sustainable development.

2.   Teacher-educators may incorporate practical activities, field trips, projects, group work, role play and discussions methods to improve the behavioral dimension of student-teachers' sustainability consciousness.

3.   Institutions can arrange seminars, community services activities, and research initiatives to increase the sustainability awareness among students, as these activities will help the institutions to achieve SDG4.

4.   To address the gender disparity in teaching about sustainable development, teacher-educators may tailor their teaching methods to cater to the unique interests and needs of male and female students.

5.   Training and support may be provided to teacher-educators in order to incorporate the economic dimension of sustainability into their curriculum and teaching practices, as student-teachers have a weaker understanding of this aspect.

6.   When incorporating sustainability education into the classroom, teacher-educators may take into account the age level of their students as it will enable them to tailor their approach and focus on the specific needs of their students.

7.   Teacher-educators may be encouraged and trained to use student-centered approaches, such as projects and discussions, to help student-teachers develop a more positive attitude and behavior towards sustainability.

8.   In order to integrate sustainability in the whole education system, a dedicated course / degree program may be introduced. Further, necessary training may be provided to both the pre-service and in-service teachers.

5.6   Future Research

1.   Future research could consider doing an experimental study on the suggested model to gauge how well it would fit into the four-year B.Ed. curriculum.

2.   Students engaged in different programs of study, such as MA Education, MPhil Education, and Ph.D. Education, and in-service teachers, may also have their SC examined. The results may then be compared to those of B. Ed students.

3.   It is also possible to research the techniques and teaching philosophies used to deliver the ESD curriculum.

4.   The scope of this study might be extended to include other regions of Pakistan. A cross-cultural analysis might be desirable to investigate current results on populations of other cultures. The study's sample was limited in breadth since it included only public sector university students. To make comparisons, future researchers might include students from private universities.

5.   The future studies can conduct similar study by engaging teacher-educators in their research in order to understand their point of view, challenges and opportunities to integrate ESD in their classroom.

6.   Future studies can also assess the institutional level engagement in ESD integration and its impact on the student-teachers and teacher-educators knowledge, attitude and behavior.

7.   In the same way that a study can be conducted with other teacher education programs students who choose ESD as a course of study to learn about the change in their behavior and perception during the study and then after the study in their relevant field. It is necessary to investigate the perceptions of teachers at other levels of education, such as secondary and college level.

5.7   Study limitations

1.   The study's generalizability was limited because the sample only comprised public sector institutions. Inclusion of the private sector could have resulted in different outcomes.

2.   In the current study, semi-structured interviews were done online, however on-campus student replies might be employed to obtain more detailed information from respondents.

3.   Although questionnaires and interviews were used to measure teacher-educators' teaching styles, an observation approach might be more useful for analyzing the usefulness of teaching styles on students' SC.

4.   Students' attitudes toward SD were examined by their actual engagement; non-participation observation may assist future researchers in gaining a real picture of their sustainability activities.

5.   The research study might be done in other places of teacher education institutes; including other regions may provide different outcomes.

6.   In this study, student-teachers were chosen to collect data on teaching methods. Subject instructors' cooperation could be sought for analyzing their obstacles while incorporating sustainability-related topics in their classroom.

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RESEARCH TOPIC AND SUPERVISOR APPROVAL LETTER

NATIONAL UNIVERSITY OF MODERN LANGUAGES
FACULTY OF SOCIAL SCIENCES
DEPARTMENT OF EDUCATION

ML.1-4/2017/Edu

Dated: 30-07-2020

To: Ayesha Nousheen,
       769-Ph.D/Edu/F18

Subject: **APPROVAL OF Ph.D THESIS TOPIC AND SUPERVISOR**

1.   Reference to Letter No, ML.1/2/2020-Edu, dated 06-07-2020, the Higher Authority has approved the topic and supervisor on the recommendation of Faculty Board of Studies vide its meeting held on 14th May 2020.

    a. **Supervisor's Name & Designation**
        Dr. Sajid Ali Yousafzai (Contract),
        Assistant Professor,
        Department of Education NUML, Islamabad.

    b. **Topic of Thesis**
        "Exploring Teacher Educators' Teaching Styles and Student Teachers' Sustainability Consciousness."

2.   You may carry out research on the given topic under the guidance of your Supervisor and submit the thesis for further evaluation within the stipulated time. It is inform you that your thesis should be submit within described period by 31 **August 2023** positively for further necessary action please.

3.   As per policy of NUML, all MPhil/PhD thesis are to be run on turnitin by QEC of NUML before being sent for evaluation. The university shall not take any responsibility for high similarity resulting due to thesis run from own sources.

4.   Thesis are to be prepared strictly on NUML's format that can be had from (Coordinator, Department of Education)

Telephone No: 051-9265100-110 Ext: 2090
E-mail: ftabassum@numl.edu.pk

Dr. Marium Din
A/Head,
Department of Education

Distribution: Ms. Ayesha Nousheen (Ph.D Scholar)

Dr. Sajid Ali Yousafzai (Thesis Supervisor)

APPENDIX B

CHANGE OF SUPERVISOR LETTER

NATIONAL UNIVERSITY OF MODERN LANGUAGES
FACULTY OF SOCIAL SCIENCES
DEPARTMENT OF EDUCATION

M.L.1-3/Edu/2021   Dated: 02-07-2021

To: Ayesha Nousheen,
       769/PhD/Edu/F-18

Subject: <u>Approval of Change of Supervisor</u>

1.   The Competent Authority has approved the removal of Dr. Sajid Ali Yousafzai from the responsibility of supervisor and assigned of Dr. Farkhanda Tabassum as a new Supervisor on the recommendation of Faculty Board of Studies vide its meeting held on 04-05-2021 and BASR dated 02-06-2021.

2.   You may continue your research work on the given topic under the guidance of your supervisor submit the thesis for evaluation within the stipulated time. It is to inform you that your thesis should be submitted within described period by 31st August 2023 positively for further necessary action please.

3.   As per policy of NUML, all MPhil/PhD thesis are to be run on turnitin by QEC of NUML before being sent for evaluation. The university shall not take any responsibility for high similarity resulting due to thesis run from own sources.

4.   Thesis is to be prepared strictly on NUML's format that can be taken from Coordinator, Department of Education

Telephone No: 051-9265100-110 Ext: 2090
E-mail: hod-edu@numl.edu.pk

Dr. Wajeeha Shahid
Head,
Department of Education

CC:

Dr. Farkhanda Tabassum

Ms. Ayesha Nousheen

APPENDIX C

PERMISSION FOR DATA COLLECTION

DEPARTMENT OF EDUCATION
FACULTY OF SOCIAL SCIENCES
National University of Modern Languages
Sector H-9, Islamabad
Tel.No: 051-9265100 Ext: 2090

ML.1-3/2020-Edu/804

Dated:23-08-2021

WHOM SO EVER IT MAY CONCERN

Ms. Ayesha Nousheen D/O Mastan Khan, students of PhD (Edu) Registration # 769/PhD/Edu/F-18 Department of Education of National University of Modern Languages is engaged in project of Research Work.

She may please be allowed to visit your Institution / Library to obtain the required information for her Research Work.

This information shall not be divulged to any unauthorized person or agency. It shall be kept confidential.

Dr Wajeeha Shahid
Head,
Department of Education.

RESEARCH QUESTIONNAIRES

COVER LETTER OF QUESTIONNAIRE

EXPLORING TEACHER-EDUCATORS' TEACHING STYLES AND STUDENT-TEACHERS' SUSTAINABILITY CONSCIOUSNESS

Dear Respondent,

I am a Ph.D. Scholar at the Department of Education, National University of Modern Languages, Islamabad. I am working on a research thesis topic, "exploring teacher-educators' teaching styles and student-teachers' sustainability consciousness". The questionnaire in hand is to collect data for my Ph.D research work. You are requested to fill in the questionnaire attached. It is assured that your responses will be kept confidential and will not be disclosed to any person or authority. Moreover, the information shall only be used for research purposes.

Ayesha Nousheen
Ph.D. (Education) Scholar
Department of Education,
NUML Islamabad

Section I	Demographic Variables

1. Gender   ☐ Male   ☐ Female

2. University   _____

3. Program   ☐ B.Ed (Hons)   ☐ BS (Edu)

4. Semester   _____

5. Age   _____

6. Which course among the enlisted subject have you studied recently (no more than 6 months ago)?

☐ Environmental Education
☐ Contemporary Issues and Trends in Education
☐ Pakistan Studies
☐ Social Studies

Section II	Teacher-Educator Teaching Styles

The following section pertains to your teacher teaching style. Teaching styles are principles, strategies, and behaviors adopted by teachers to enable students' learning. Kindly choose the appropriate option that best suits your teacher teaching style while teaching the subject that you have chosen above. Please rate each statement on a five-point Likert scale where 1 = Strongly disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), 5 = Strongly Agree (SA).

S#	Statements	SD	D	N	A	SA
1	The teacher emphasizes facts, concepts, and principles.	1	2	3	4	5
2	Sharing knowledge and expertise with students is very important to the teacher.	1	2	3	4	5
3	What the teacher say about a topic is important for students to acquire a broader perspective on the issues in that area.	1	2	3	4	5
4	The teacher wants students to leave this course well prepared for further work in this area.	1	2	3	4	5
5	Teacher uses lecture method in each class session	1	2	3	4	5
6	The teacher uses his/her expertise to resolve disagreements about content issues	1	2	3	4	5
7	The teacher can be described as a "storehouse of knowledge" who dispenses the facts, principles, and concepts we need.	1	2	3	4	5
8	The time available for this course was not enough to cover the material of the course.	1	2	3	4	5
9	The teacher sets high standards for students in this class	1	2	3	4	5
10	The teacher gives students negative feedback when their performance is unsatisfactory.	1	2	3	4	5
11	The teacher standards and expectations are strict and rigid.	1	2	3	4	5

S#	Statements	SD	D	N	A	SA
12	The teacher defines what students must learn and how they should learn it.	1	2	3	4	5
13	The teacher provides very clear guidelines for how he/she wants tasks to be completed in this course.	1	2	3	4	5
14	The teacher sets very specific goals and objectives for this course.	1	2	3	4	5
15	The teacher clearly states his/her expectations for what he/she wants students to do in this class.	1	2	3	4	5
16	The teacher standards and expectations help students develop the discipline we need to learn.	1	2	3	4	5
17	The teacher models appropriate ways for students to think about issues in the content.	1	2	3	4	5
18	The teacher encourages students to emulate the example he/she provide.	1	2	3	4	5
19	The teacher shows students how and what to do in order to master the course content.	1	2	3	4	5
20	The teacher provides examples from his/her personal experiences often to illustrate points about the material.	1	2	3	4	5
21	The teacher often shows students how we can use various principles and concepts.	1	2	3	4	5
22	The teacher provides frequent verbal and/or written comments on student performance.	1	2	3	4	5
23	Eventually, students and teacher develop similar thinking regarding the course content.	1	2	3	4	5
24	The teacher can be described as a "coach" who works closely with someone to correct problems in how they think and behave.	1	2	3	4	5
25	The teaching goals and methods addresses a variety of student learning styles.	1	2	3	4	5
26	The teacher spends time consulting with students on how to improve their work on individual and/or group projects.	1	2	3	4	5
27	The teacher employs small group discussions to help students develop their ability to think critically.	1	2	3	4	5
28	The teacher guides students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things.	1	2	3	4	5
29	The course activities encourage students to take initiative and responsibility for their learning.	1	2	3	4	5
30	The teacher solicits student advice about how and what to teach in this course.	1	2	3	4	5
31	The teacher allows students to make choices among activities in order to complete course requirements.	1	2	3	4	5
32	The teacher gives students a lot of personal support and encouragement to do well in this course.	1	2	3	4	5
33	Students typically work on course projects alone with little supervision from the teacher.	1	2	3	4	5

S#	Statements	SD	D	N	A	SA
34	Activities in this class encourage students to develop their own ideas about content issues.	1	2	3	4	5
35	The teacher allows students to design one or more self-directed learning experiences.	1	2	3	4	5
36	The teacher goal is to develop the ability of students to think and work independently is an important goal of the teacher's teaching.	1	2	3	4	5
37	The teacher encourages students to take responsibility for teaching part of the class sessions.	1	2	3	4	5
38	The teacher allows students to set their own pace for completing independent and/or group projects.	1	2	3	4	5
39	The teacher approach to teaching is similar to a manager of a work group who delegates tasks and responsibilities to subordinates.	1	2	3	4	5
40	The teacher assumes the role of a resource person who is available to students whenever they need help.	1	2	3	4	5

Section III — Sustainability Consciousness

The following section pertains to measuring your awareness, attitude, and behavior towards sustainable development. Please rate each statement on five-point Likert scale where 1 = Strongly disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), 5 = Strongly Agree (SA).

S#	Statements	SD	D	N	A	SA
1	Reducing water consumption is necessary for sustainable development.	1	2	3	4	5
2	Preserving nature is not necessary for sustainable development.	1	2	3	4	5
3	Sustainable development demands that we reduce all sorts of waste	1	2	3	4	5
4	Preserving the variety of living creatures is necessary for sustainable development (preserving biological diversity)	1	2	3	4	5
5	Sustainable development requires a shift to renewable natural resources	1	2	3	4	5
6	People need to be educated about natural disasters for sustainable development	1	2	3	4	5
7	Sustainable development is aided by increasing people's prospects for living long, healthy lives.	1	2	3	4	5
8	A culture where conflicts are resolved peacefully through discussion is necessary for sustainable development	1	2	3	4	5
9	People who know and exercise their democratic rights are necessary for sustainable development.	1	2	3	4	5
10	Reinforcing women's rights and equality is necessary for sustainable development	1	2	3	4	5

S#	Statements	SD	D	N	A	SA
11	Human rights must be respected for sustainable development	1	2	3	4	5
12	Access to good education is necessary for sustainable development.	1	2	3	4	5
13	Respect for other cultures is necessary for sustainable development	1	2	3	4	5
14	Major infectious diseases must be stopped for a sustainable development.	1	2	3	4	5
15	Sustainable development requires that companies act responsibly towards their employees, customers, and suppliers	1	2	3	4	5
16	Fair distribution of goods and services is necessary for sustainable development.	1	2	3	4	5
17	Eradicating poverty is necessary for sustainable development	1	2	3	4	5
18	Sustainable development demands that people understand how the economy functions.	1	2	3	4	5
19	I think that using more natural resources than we need does not threaten the health and well-being of people in the future.	1	2	3	4	5
20	I think that we need stricter laws and regulations to protect the environment.	1	2	3	4	5
21	I believe it is crucial to take action against issues related to climate change.	1	2	3	4	5
22	I think it is OK that each one of us uses as much water as we want.	1	2	3	4	5
23	I think that everyone ought to be allowed to acquire the knowledge, values, and skills that are necessary to live sustainably	1	2	3	4	5
24	I Think it is the responsibility of the current generation to ensure better living standard of future generations.	1	2	3	4	5
25	In think the government should offer financial assistance to encourage people to shift towards environmentally friendly vehicles.	1	2	3	4	5
26	I think the government need to base all of its choices/decisions on sustainable development.	1	2	3	4	5
27	I think that it is important that people in society exercise their democratic rights and become involved in important issues.	1	2	3	4	5
28	I think that women and men must be given the same opportunities for education and employment	1	2	3	4	5
29	I think that companies have a responsibility to reduce the use of packaging and disposable articles.	1	2	3	4	5
30	I think it is important to reduce poverty	1	2	3	4	5
31	I think that companies in rich countries should give employees in poor nations the same conditions as in rich countries.	1	2	3	4	5

S#	Statements	SD	D	N	A	SA
32	I think that people who pollute environmental should pay for the damage they cause to the environment.	1	2	3	4	5
33	When it's feasible, I prefer to go by bicycle or foot as opposed to driving a car.	1	2	3	4	5
34	I never wastewater	1	2	3	4	5
35	I recycle as much as I can	1	2	3	4	5
36	I pick up rubbish when I see trash out in the open or in public areas.	1	2	3	4	5
37	When I have the chance, I always segregate food waste before throwing it in the trash.	1	2	3	4	5
38	I have changed my lifestyle to reduce waste (e.g., throwing away less food or not wasting materials)	1	2	3	4	5
39	When I use a computer or mobile to chat, to text, to play games and so on, I always treat others as respectfully as I would in real life	1	2	3	4	5
40	I often make lifestyle choices that are not good for my health.	1	2	3	4	5
41	I work on committees (e.g., the student council, my class committee, the cafeteria committee) at my school.	1	2	3	4	5
42	I treat everyone with the same respect, even if they have another cultural background than mine	1	2	3	4	5
43	I support an aid organization or environmental group	1	2	3	4	5
44	I show the same respect to men and women, boys, and girls	1	2	3	4	5
45	I do things that help poor people	1	2	3	4	5
46	I often purchase second-hand goods over the internet or in a shop	1	2	3	4	5
47	I avoid buying goods from companies with a bad reputation for looking after their employees and the environment	1	2	3	4	5
48	I read newspapers articles and watch news programs about economy.	1	2	3	4	5

APPENDIX E

CONSENT LETTER FOR INTERVIEW PARTICIPANTS

Consent for Participation in the Study titled "Exploring teacher-educators'

teaching styles and student-teachers' sustainability consciousness"

I volunteer to participate in the interview conducted by Ayesha Nousheen as part of her doctoral study.

1. I know that the researcher is a student at the National university of Modern Languages and a visiting faculty in the department of Education at University of Education Attock Campus.
2. I fully understand that this research is pure academic endeavor.
3. My participation in this research would be voluntary without any monetary benefits.
4. I have a right to withdraw or discontinue my participation in the interview.
5. If I feel uncomfortable during the interview, I have a right to refuse to answer a question
6. If I refuse to participate in the study, head of my institute/ department would not be informed.
7. I know that interview would last for around 30 minutes; the interviewer would keep taking notes and the interview would be audio-taped.
8. I know that the researcher would keep my identity anonymous for confidentiality sake and any subsequent use of my interview record and reflections will be subject to my permission.
9. I know that the faculty and head of my institute/ department will not have access to my
responses given to the researcher.
10. I understand that this research study had been allowed by the Advanced Research Board of NUML.
11. I have read and understood the explanation provided to me and I voluntarily agree to
participate in this study. I have been given a copy of this consent form.

----------------------------   ----------------------
Participant signature   Researcher signature

APPENDIX F

LIST OF INTERVIEW QUESTIONS

1. How many aspects of Sustainable development do you know?
2. What do you know about sustainable development? Probe: how you came to know about sustainable development?
3. How we can save the environment, economy, and society for our future without compromising on the future needs.
4. Do you think your actions contribute towards sustainable development? If yes, how? Probe: What are your actions towards sustainable development?
5. Which subjects / course, in particular, offers content related to Sustainable development and how did the course affect your learning about the SD?
6. Do you think the teaching styles were effective in developing your attitude and behavior towards sustainable development?
7. Please describe one or two highlights of your classroom experience while teacher teach you sustainability-related concepts.

APPENDIX G

PERMISSION LETTER FOR USE OF RESEARCH TOOLS

M Gmail   Ayesha Nousheen <ayeshanousheenktk@gmail.com>

Permission to Use Sustainability Consciousness Questionnare (SCQ)
2 messages

Ayesha Nousheen <ayeshanousheenktk@gmail.com>   Sun, Nov 29, 2020 at 8:24 AM
To: niklas.gericke@kau.se

Respected Professor Niklas Gericke!

I hope you are doing well. My name is Ayesha Nousheen and I am a Ph.D. scholar at the National University of Modern Languages, Islamabad, Pakistan. I am conducting my research in the area of sustainability education in Pakistan. In this regard, one of the key variables of my study is students' sustainability consciousness.

In view of the above, this email pertains to seek your approval to use the sustainability consciousness questionnaire (SCQ) published in your article namely "The Sustainability Consciousness Questionnaire: The theoretical development and empirical validation of an evaluation instrument for stakeholders working with sustainable development". The questionnaire will be used solely for academic purposes.

looking forward to hearing from you soon.

Regards,

Ayesha Nousheen
Ph.D. Scholar
National University of Modern Languages
Islamabad, Pakistan

Niklas Gericke <niklas.gericke@kau.se>   Mon, Nov 30, 2020 at 12:16 PM
To: Ayesha Nousheen <ayeshanousheenktk@gmail.com>

Dear Ayesha,

you are very welcome to use the questionnaire. Please, just refer properly from were you got it.

Good luck with your studies!

Best Reagrds,

Niklas Gericke

Från: Ayesha Nousheen <ayeshanousheenktk@gmail.com>
Skickat: den 29 november 2020 04:24:53
Till: Niklas Gericke
Ämne: Permission to Use Sustainability Consciousness Questionnare (SCQ)

Consent Given to Another Doctoral Student Before Dr. Grasha's Death Below is a screenshot of a letter of permission that Dr. Grasha wrote to a different doctoral student before he died granting his consent for the use of the survey. Please note the second paragraph in the letter where Dr. Grasha wrote that he "has never sold any of [his] instruments…, [and that] they are available to use free of charge" (Grasha, 2004, as cited in Andrews, 2004, p. 93). Dr. Grasha also highlighted that his works were made for the general public to use without barriers that may impede their research (Grasha, 2004, as cited in Andrews, 2004, p. 93

Permission to use Teaching Style Inventory

Hello Jill Andrews:

Thanks for the information you sent. I appreciate it. Unfortunately the web has turned into a "free for all" and any information that is in an electronic format can be posted with our without the author's position. I understand the norms currently in existence and basically am curious about where people have come in contact with the instrument more than anything else. Very little one can do to stop someone from posting it so I basically monitor things to make sure no one is selling it online.

I've never sold any of the instruments I've developed. They are available to use for free of charge and all that I've asked is that people give me a summary of the outcome of their study. My work is done not only for my personal curiosity as a psychologist but it's "for the people." I see no need to set up barriers to people using it.

I am familiar with the Glenda Short dissertation and had several communications with her. There's a lot of interest in the concepts outside the US including thesis work in the Philippines, Turkey, Spain, Malaysia, Singapore, Hong Kong, Australia, Thailand, and other places. As I tell people, the instrument is a work in process and the underlying model and concepts benefit from what people do with it. I am just delighted that others are interested.

If you want to use the TSI in your study, you certainly have my permission to make copies and do so. Just send me a summary of your outcomes.

Take care,

Tony Grasha

TOOL VALIDITY CERTIFICATE FROM EXPERTS

Beaconhouse National University
School of Education
Tarogil, Off Raiwind Road, Lahore 54400, Pakistan

BNU

Tel : +92-42-38100156
E-mail info@bnu.edu.pk
URL : www.bnu.edu.pk

20th November, 2021

TO WHOM IT MAY CONCERN

Subject : <u>Validation of Research Instrument</u>

It is stated that I have participated in the content validation of research instruments (questionnaire & interviews) developed/utilized by Ms. Ayesha Nousheen d/o Mastan Khan bearing registration No - 769 PhD/Edu/F18 for the topic "Exploring Teacher Educators' Teaching Styles and Student Teachers' Sustainability Consciousness". It is apprised that research instruments are valid from a content perspective and can be used in the abovementioned research for data collection.

Dr. Qudsia Kalsoom
Head, Department of Educational Leadership
& Management
Beaconhouse National University, Pakistan

Certificate for Tool Validation

CERTIFICATE OF VALIDITY

(Teacher-Educator Teaching style and Student-Teachers Sustainability Consciousness)

EXPLORING TEACHER EDUCATORS' TEACHING STYLES AND STUDENT TEACHERS' SUSTAINABILITY CONSCIOUSNESS

By Ms. Ayesha Nousheen

PhD Scholar, Department of Education National University of Modern Languages, Islamabad, Pakistan

It is hereby certified that the tool Teaching Styles Inventory (TSI): Version 3.0 developed by Grasha (1996) adapted by the scholar for teacher-educator teaching styles and Sustainability Consciousness Scale longer version (SCQ-L) developed by Gericke et al., (2019) for her research topic "Exploring Teacher Educators' Teaching Styles and Student Teachers' Sustainability Consciousness" has been assessed and it is found appropriate for the data collection process. All the items in the tool are meeting the objectives and addressing the research question and research hypothesis. Face and content validity are also assured, and it may be used by the researcher for the data collection process.

Name __Dr. Shazia Zamir__

Designation __Assistant · professor__

Institute __NUML ,- Islamabad__

Signature _____

Date _____

UNIVERSITY OF EDUCATION, ATTOCK CAMPUS
DEPARTMENT OF EDUCATION

TO WHOM IT MAY CONCERN

Subject : <u>Validation of Interview Protocols / Questions</u>

It is to certify that I have participated in the content validation of the interview protocols / questions developed by Ms. Ayesha Nousheen D/O Mastan Khan bearing registration No - 769 PhD/Edu/F18 for her PhD thesis titled "Exploring Teacher Educators' Teaching Styles and Student Teachers' Sustainability Consciousness". It is apprised that the interview protocols are suitable for data collection for the issue in question. The PhD scholar may collect data with fair amount of confidence on the above-mentioned protocol.

Name: Dr Shafqat Ali khan

Designation: Assistant professor

Institute: University of Education

Signature: _____

Assistant Professor
University of Education
Attock Campus
Attock Campus

UNIVERSITY OF EDUCATION, ATTOCK CAMPUS
DEPARTMENT OF EDUCATION

15 November, 2020

TO WHOM IT MAY CONCERN

Subject : <u>Validation of Research Instrument</u>

It is stated that I have participated in the content validation of research instruments (questionnaire & interviews) developed/utilized by Ms. Ayesha Nousheen d/o Mastan Khan bearing registration No - 769 PhD/Edu/F18 for the topic "Exploring Teacher Educators' Teaching Styles and Student Teachers' Sustainability Consciousness". It is apprised that research instruments are valid from a content perspective and can be used in the abovementioned research for data collection.

Dr. Shafqat Ali Khan
Assistant Professor
Department of Education
University of Education, Attock Campus
Punjab, Pakistan

NATIONAL UNIVERSITY OF MODERN LANGUAGES, ISLAMABAD
FACULTY OF SOCIAL SCIENCE
DEPARTMENT OF EDUCATION

18 November, 2020

TO WHOM IT MAY CONCERN

Subject : <u>Validation of Research Instrument</u>

It is stated that I have participated in the content validation of research instruments (questionnaire & interviews) developed/utilized by Ms. Ayesha Nousheen d/o Mastan Khan bearing registration No - 769 PhD/Edu/F18 for the topic "Exploring Teacher Educators' Teaching Styles and Student Teachers' Sustainability Consciousness". It is approved that research instruments are valid from a content perspective and can be used in this research for data collection.

Dr. Yasir Hussain,
Assistant Professor,
Department of Education,
National University of Modern Languages
Islamabad, Pakistan.

<u>Certificate for Tool Validation</u>

CERTIFICATE OF VALIDITY

(Teacher-Educator Teaching style and Student-Teachers Sustainability Consciousness)

EXPLORING TEACHER EDUCATORS' TEACHING STYLES AND STUDENT TEACHERS' SUSTAINABILITY CONSCIOUSNESS

By Ms. Ayesha Nousheen

PhD Scholar, Department of Education National University of Modern Languages, Islamabad, Pakistan

It is hereby certified that the tool Teaching Styles Inventory (TSI): Version 3.0 developed by Grasha (1996) adapted by the scholar for teacher-educator teaching styles and Sustainability Consciousness Scale longer version (SCQ-L) developed by Gericke et al., (2019) for her research topic "Exploring Teacher Educators' Teaching Styles and Student Teachers' Sustainability Consciousness" has been assessed and it is found appropriate for the data collection process. All the items in the tool are meeting the objectives and addressing the research question and research hypothesis. Face and content validity are also assured, and it may be used by the researcher for the data collection process.

Name __Dr. Aisha Bibi__

Designation __Assistant Professor__

Institute __NUML__

Signature __Aisha__

Date _____

INTERNATIONAL ISLAMIC UNIVERSITY, ISLAMABAD
FACULTY OF SOCIAL SCIENCE
DEPARTMENT OF EDUCATION

November, 2020

TO WHOM IT MAY CONCERN

Subject : <u>**Validation of Research Instrument**</u>

It is stated that I have participated in the content validation of research instruments (questionnaire & interviews) developed/utilized by Ms. Ayesha Nousheen d/o Mastan Khan bearing registration No - 769 PhD/Edu/F18 for the topic "Exploring Teacher Educators' Teaching Styles and Student Teachers' Sustainability Consciousness". It is apprised that research instruments are valid from a content perspective and can be used in the above mentioned research for data collection.

Dr. Azhar Mehmood
Associate Professor
Department of Education
International Islamic University
Islamabad, Pakistan

LIST OF INSTITUTIONS

The Fatima Jinnah Women University, Rawalpindi

Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi

Islamic International University Islamabad

National University of Modern Languages, Islamabad

Federal college of Education

Viqar-u-nisa college

Bilquis Post Graduate college for women

Allama Iqbal open University, Islamabad

Air University Islamabad